Leading Digital Transformation in Healthcare:

How Paradoxical Leadership Influences Technology Adoption

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Preface

Abstract

Digital transformation in healthcare can only achieve its intended impact when professionals are willing to adopt digital technologies and use them in everyday care. This is challenging because digital systems are introduced into work contexts shaped by competing demands, including efficiency and patient-centred care, standardization and professional autonomy. Drawing on paradox theory, this study examined how paradoxical leadership relates to technology adoption intention and self-reported technology use, and whether psychological safety and professional role identity threat sequentially mediate these relationships. A quantitative cross-sectional survey was conducted among 172 healthcare professionals in the Netherlands. The proposed model was tested separately for both outcomes using PROCESS Model 6 with bootstrapped confidence intervals. Paradoxical leadership was not directly associated with either outcome. However, the sequential indirect pathway was supported for technology adoption intention: paradoxical leadership was positively associated with psychological safety, which was negatively associated with professional role identity threat, which in turn was negatively associated with technology adoption intention. This pathway was not supported for self-reported technology use. Additional findings showed that paradoxical leadership was positively associated with professional role identity threat in the intention model, while psychological safety was negatively associated with self-reported technology use. Exploratory analyses suggested that learning resources may represent an additional organizational pathway for both adoption outcomes. Overall, paradoxical leadership appears to matter less as a direct driver of technology adoption and more as an indirect, enabling approach that shapes how professionals navigate identity-relevant tensions during digital transformation.

Keywords: digital transformation, paradoxical leadership, healthcare, technology adoption, organizational change, psychological safety, identity threat

1. Introduction

Digital technologies are increasingly reshaping how healthcare organizations organize work, deliver care, and seek to improve operational efficiency (Kraus et al., 2021). This broader organizational change, commonly referred to as digital transformation (DT), is defined as deep organizational change driven by digital technologies that reshape organizational structures, processes, and strategic positioning (Vial, 2019). While DT promises improved efficiency, data-driven decision-making, and enhanced patient outcomes (Mas et al., 2023), many initiatives fail to achieve their intended impact, reflected in high failure rates (Volpentesta et al., 2023). A key reason for this implementation gap lies not only in technological capabilities, but in how employees adopt and use these technologies in their daily work (Ullrich et al., 2023; Stoumpos et al., 2023). This study therefore focuses on technology adoption as an employee-level process, encompassing both professionals' intention to use digital systems and their self-reported use in practice (Venkatesh et al., 2003).

In healthcare, technology adoption is especially challenging because professionals operate within strong occupational identities and high-stakes decision-making environments (Pratt et al., 2006). When digital systems are introduced into this context, they may fundamentally alter established routines and ways of working (Leonardi, 2011). Such changes create enduring tensions, as healthcare organizations must optimize efficiency through standardized digital systems while simultaneously preserving individualized patient attention and professional discretion. Healthcare has therefore been described as inherently paradoxical, marked by competing demands between efficiency and quality, and between technological innovation and human compassion (Desveaux, 2025). These paradoxical tensions can in turn influence how professionals perceive and engage with digital systems (Kratochvil, 2025). Understanding what shapes healthcare professionals' willingness to adopt and use digital technologies is thus essential to explaining why technological initiatives succeed or fail.

Leadership has long been recognized as a critical factor in shaping employees' responses to organizational change (Herold et al., 2008; Oreg & Berson, 2019). In the context of DT in healthcare, leaders are confronted with these same competing demands, such as balancing efficiency with individualized patient care and technological innovation with professional autonomy. One leadership approach that explicitly addresses such tensions is paradoxical leadership. Paradoxical leadership refers to leader behaviors that embrace and integrate competing demands, for example maintaining control while granting autonomy, enforcing performance standards while allowing flexibility, and treating employees uniformly while recognizing individual differences (Zhang et al., 2015; Lee et al., 2023). By acknowledging rather than suppressing tensions, paradoxical leaders may help healthcare professionals navigate uncertainty and adapt constructively to digital change. Indeed, prior research has linked paradoxical leadership to positive change-related outcomes such as employee creativity, change-readiness, and performance (Yang et al., 2019; Sparr et al., 2022). Given the persistent professional tensions in the healthcare context, this study examines how paradoxical leadership relates to healthcare professionals' technology adoption intention and self-reported technology use. By positioning paradoxical leadership as a key leadership approach in healthcare DT, we seek to explain how leaders can help professionals navigate competing demands inherent in digital change.

Although leadership shapes employees' responses to organizational change, research increasingly emphasizes the importance of understanding the psychological mechanisms through which such influence occurs (Miscenko & Day, 2016; Oreg & Berson, 2019). Micro-foundational perspectives on paradox theory suggest that individuals' cognitive and emotional interpretations of competing demands are central to how paradoxical contexts are experienced (Miron-Spektor et al., 2018). A key psychological mechanism through which paradoxical leadership may shape professionals' experience of digital change is psychological safety, referring to professionals' perceptions that their team is safe for interpersonal risk-taking, such as admitting mistakes or expressing uncertainty (Edmondson, 1999). Prior research suggests that paradoxical leadership is positively associated with psychological safety (Sürücü et al., 2025), yet this relationship remains underexamined in healthcare settings, where competing demands are particularly salient. By acknowledging competing demands while encouraging open communication (Zhang et al., 2015), paradoxical leaders may create conditions in which healthcare professionals feel more able to discuss uncertainties and concerns related to digital change (Newman et al., 2017).

This role of psychological safety is particularly relevant in healthcare, where professional role identity is strongly embedded in specialized knowledge, clinical judgment, and discretionary authority (Pratt et al., 2006). Professional role identity refers to how professionals define themselves in relation to their work role (Chreim et al., 2007). Professional role identity threat, in turn, occurs when changes in the work environment are perceived as potentially harmful to the value, meaning, or enactment of this professional role (Petriglieri, 2011). In healthcare DT, such threats may arise when digital systems are perceived as challenging professional expertise, autonomy, or the care provider role (Jussupow et al., 2022). These identity-related concerns can trigger protective responses and reduce professionals' openness to digital technologies (Petriglieri, 2011), thereby limiting meaningful technology adoption (Jussupow et al., 2022). Psychological safety may therefore serve as a key resource that shapes the extent to which DT is experienced as threatening to professional role identity and, through this pathway, influences technology adoption. Yet how these psychological mechanisms operate sequentially to explain technology adoption among healthcare professionals during DT remains underexplored.

By integrating paradoxical leadership, psychological safety, and professional role identity threat, this study proposes a sequential mediation model that examines how leadership shapes technology adoption in healthcare. Accordingly, we address the following research question: How does paradoxical leadership influence technology adoption among healthcare professionals during digital transformation? This study contributes to research in three ways. First, it advances DT research in healthcare by integrating paradox theory with micro-level psychological and identity processes, thereby shifting attention from technology-centric explanations to employees' psychological interpretations of digital change. By conceptualizing psychological safety and professional role identity threat as sequential mediating mechanisms, we offer a micro-foundational perspective on how leadership may shape technology adoption. Second, we extend paradoxical leadership research by examining its role in contexts characterized by enduring professional tensions. Third, this study contributes to the technology adoption literature in healthcare by explaining a psychological pathway through which leadership influences professionals' technology adoption intention and self-reported technology use during DT.

2. Theoretical framework

2.1 Technology adoption in healthcare digital transformation

Within DT, the implementation of digital systems alone does not ensure successful transformation. Employees also need to accept and use these systems in their daily work and participate in the broader change process (Ullrich et al., 2023). Accordingly, this study focuses on technology adoption as an employee-level process and, building on Venkatesh et al. (2003), examines two related but conceptually distinct dimensions: technology adoption intention and self-reported technology use. This distinction is important because behavioral intention refers to professionals' motivation or willingness to use a technology, whereas use refers to technology-related behavior in practice (Ammenwerth, 2019). Recent findings among nursing professionals further support this, showing that strong intention to use digital technologies does not necessarily translate into frequent use (Xie et al., 2025). Examining both dimensions separately is therefore important for understanding how professionals engage with digital systems introduced as part of DT.

The distinction between intention and use is particularly relevant in healthcare, as digital systems must be integrated into established clinical workflows and professional routines (Leonardi, 2011). Professionals must not only decide whether they are willing to adopt these systems, but also navigate how they fit with clinical judgment, care responsibilities, and established ways of working. As a result, technology adoption unfolds within competing demands between standardization and discretion, and between stability and change. These demands can generate strain and shape how professionals engage with digital technologies (Kratochvil, 2025). This complexity is further evidenced by persistent barriers to technology adoption in healthcare, including concerns about autonomy, workload, professional judgment, and resistance to change (Stoumpos et al., 2023; Alotaibi et al., 2025). Together, these challenges suggest that technology adoption in healthcare depends not only on technical or usability-related factors, but also on how professionals interpret and respond to digital change.

2.2 Paradoxical leadership

In this context, leadership is particularly important because it helps professionals navigate persistent competing demands, such as efficiency versus quality of care and technological innovation versus professional discretion (Waldman & Bowen, 2016; Desveaux, 2025). Paradox theory describes such demands as contradictory yet interrelated elements that coexist over time (Smith & Lewis, 2011). This makes paradoxical leadership especially relevant because it reflects leader behaviors that acknowledge and integrate competing demands rather than prioritizing one side at the expense of the other. In people management, paradoxical leadership refers to the simultaneous enactment of seemingly competing yet interrelated leader behaviors, such as maintaining control while granting autonomy or enforcing standards while remaining supportive (Zhang et al., 2015). In this way, paradoxical leaders provide a broader relational and interpretive context in which tensions are legitimized as manageable rather than framed as incompatible. In change settings, such leader behavior can function as sensegiving by helping professionals interpret competing demands more constructively (Sparr et al., 2022).

Although prior research provides evidence that clinical leadership can contribute positively to health information technology adoption in healthcare organizations (Ingebrigtsen et al., 2014), less is known about whether paradoxical leadership is associated with healthcare professionals' technology adoption intention and self-reported technology use during DT. Yet such a relationship may be particularly relevant given the paradoxical nature of healthcare DT. By framing competing demands as manageable rather than mutually exclusive, paradoxical leaders may help professionals make sense of digital systems as both meaningful and workable in daily healthcare practice. For example, they may help professionals navigate the tension between efficiency and quality of care by presenting digital systems not only as instruments of standardization, but also as tools that can support coordinated and reliable care. They may also help professionals reconcile the tension between standardized digital routines and professional discretion by clarifying why digital systems matter while leaving room for professional judgment in how these systems are applied in specific care situations. In addition, they may support the integration of new digital routines into existing work processes, thereby reducing the perceived tension between technological change and continuity. Accordingly, paradoxical leadership is expected to be positively associated with technology adoption intention and self-reported technology use.

H1a: Paradoxical leadership is positively associated with technology adoption intention.

H1b: Paradoxical leadership is positively associated with self-reported technology use.

2.3 Psychological safety

Beyond these direct associations, paradoxical leadership may also shape technology adoption through psychological mechanisms (Miscenko & Day, 2016; Oreg & Berson, 2019). A key mechanism in this regard is psychological safety, which in this study refers to professionals' perceptions that their team is safe for interpersonal risk-taking, such as speaking up, admitting mistakes, or expressing uncertainty (Edmondson, 1999). Psychological safety is particularly relevant in healthcare DT because it enables professionals to engage in learning-related behaviors, such as voicing concerns and experimenting with unfamiliar digital systems, despite the interpersonal risks involved (Newman et al., 2017). Paradoxical leadership may contribute to psychological safety by framing competing demands as manageable rather than threatening. By acknowledging tensions and encouraging open communication, paradoxical leaders signal that uncertainty, experimentation, and discussion are legitimate parts of digital change (Zhang et al., 2015; Sparr et al., 2022). This may reduce the interpersonal risks associated with speaking up about difficulties or concerns during DT.

Empirical research supports this positive association between paradoxical leadership and psychological safety, including studies in which psychological safety mediates the relationship between paradoxical leadership and employee outcomes (Xue et al., 2020; Yu et al., 2025). However, existing evidence is mainly situated in non-healthcare contexts, including Chinese organizational settings and Turkish manufacturing, limiting its generalizability to healthcare DT (Sürücü et al., 2025). Although healthcare introduces distinct tensions compared to these settings, the same underlying logic is expected to apply in healthcare DT. Accordingly, paradoxical leadership is expected to be positively associated with psychological safety.

H2: Paradoxical leadership is positively associated with psychological safety.

2.4 Professional role identity threat

Professional role identity refers to how professionals define themselves in relation to their work role, deriving meaning and self-worth from internalized expectations about competence, autonomy, and professional conduct (Ibarra, 1999; Chreim et al., 2007). In healthcare, this professional role identity is strongly embedded in specialized knowledge, clinical judgment, and discretionary authority over patient care (Pratt et al., 2006). DT can therefore become identity-relevant when digital systems standardize work practices or change how professional expertise and decision-making are enacted in everyday work (Leonardi, 2011). When such changes are perceived as potentially harmful to the value, meaning, or enactment of one's professional role, they can be understood as professional role identity threats (Petriglieri, 2011). In healthcare DT, such threats may arise when digital systems are perceived to challenge professional expertise, autonomy, recognition, or established care practices (Jussupow et al., 2022; Ackerhans et al., 2024).

Psychological safety may reduce the extent to which professionals experience DT as threatening to their professional role identity. When professionals perceive their team as safe for interpersonal risk-taking, they may more openly voice concerns, seek support, and make sense of digital change without fear of negative evaluation (Edmondson, 1999; Newman et al., 2017). This openness may help professionals interpret digital change as less threatening to their professional role identity. Accordingly, psychological safety is expected to be negatively associated with professional role identity threat.

H3: Psychological safety is negatively associated with professional role identity threat.

Beyond its role as a possible outcome of psychological safety, professional role identity threat is also expected to shape technology adoption. Identity threat can trigger defensive and self-protective responses, as individuals seek to protect valued aspects of their self-concept when these are perceived as destabilized or devalued (Petriglieri, 2011). In healthcare DT, such responses may emerge across several identity-related dimensions, including threats to professional expertise and recognition, autonomy and control, and the care provider role (Jussupow et al., 2022). These dimensions illustrate three ways in which professional role identity threat may reduce technology adoption intention and self-reported technology use. First, when digital systems are perceived as substituting professional expertise or reducing professional recognition, professionals may resist adopting technologies that feel threatening to their competence (Jussupow et al., 2022). Second, when digital systems are perceived as limiting autonomy and control over clinical decisions, professionals may be less willing to engage meaningfully with these systems (Ackerhans et al., 2024). Finally, when digital systems are perceived as altering the care provider role or the relationship with patients, professionals may experience these systems as incompatible with their professional identity, thereby reducing their willingness to adopt and meaningfully use them (Ackerhans et al., 2024). Therefore, professional role identity threat is expected to be negatively associated with both technology adoption intention and self-reported technology use.

H4a: Professional role identity threat is negatively associated with technology adoption intention.

H4b: Professional role identity threat is negatively associated with self-reported technology use.

2.5 Sequential mediation model

The hypotheses developed above suggest a sequential pathway through which paradoxical leadership may influence technology adoption in healthcare DT. Paradoxical leadership is expected to contribute to psychological safety by framing competing demands as manageable and encouraging open communication. Psychological safety, in turn, may reduce professional role identity threat by enabling professionals to voice concerns, seek support, and interpret digital systems as less threatening to their professional role identity. Reduced professional role identity threat is subsequently expected to support both technology adoption intention and self-reported technology use.

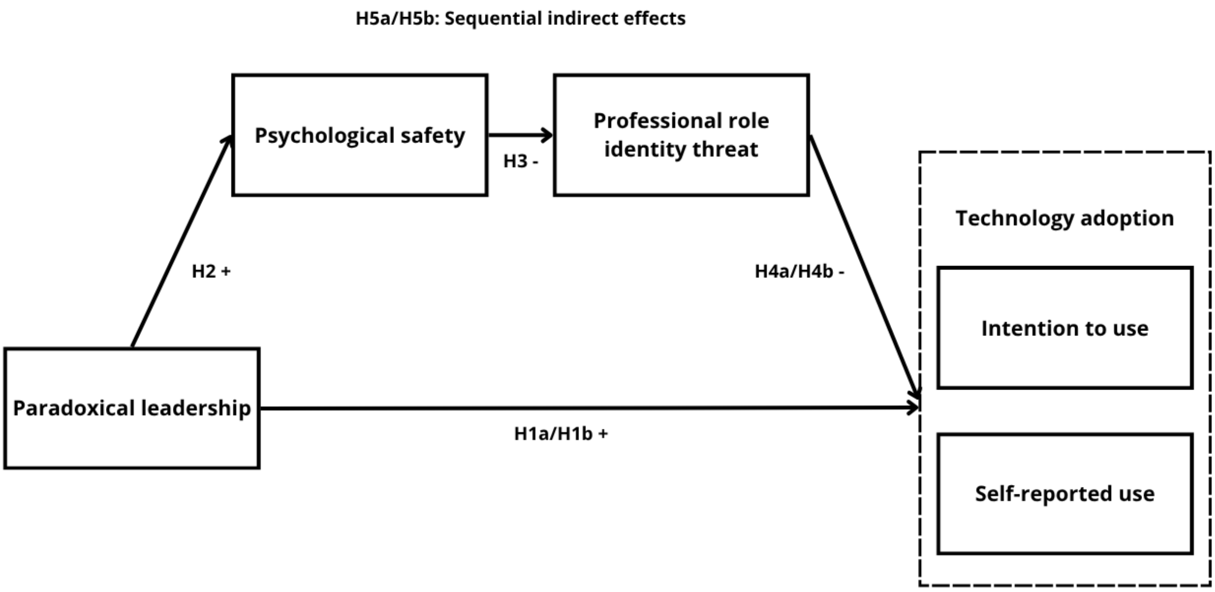
The proposed ordering of the mediators is theoretically grounded. Psychological safety reflects the perceived team climate in which professionals encounter and discuss digital change, whereas professional role identity threat reflects an identity-related appraisal of what digital change means for one's professional role. Psychological safety is therefore expected to precede professional role identity threat because it shapes the interpersonal context through which professionals interpret whether digital systems are compatible with or threatening to their professional role identity. This reasoning aligns with micro-foundational perspectives on paradox theory, which emphasize that individuals' cognitive and emotional responses to competing demands are shaped by the social and relational conditions in which these demands are experienced (Miron-Spektor et al., 2018). Together, these arguments suggest that paradoxical leadership may influence technology adoption through a sequential psychological pathway, operating first through psychological safety and subsequently through professional role identity threat. Accordingly, this study proposes the following hypotheses:

H5a: Psychological safety and professional role identity threat sequentially mediate the relationship between paradoxical leadership and technology adoption intention.

H5b: Psychological safety and professional role identity threat sequentially mediate the relationship between paradoxical leadership and self-reported technology use.

Figure 1

Conceptual Model of the Sequential Mediation Model



Note. H5a and H5b represent the proposed sequential indirect effects.

3. Method

3.1 Research design and study context

This study adopted a quantitative, cross-sectional survey design to examine how paradoxical leadership relates to technology adoption among healthcare professionals during

DT. A quantitative design was appropriate because the study aimed to test theoretically derived hypotheses about relationships between measurable constructs. This approach aligns with a positivist research logic, in which social phenomena are operationalized into observable indicators and analyzed statistically to identify patterns of association (Creswell & Creswell, 2018). Self-reported data were collected from healthcare professionals at a single point in time, allowing for the examination of associations between the theoretically derived constructs (Saunders et al., 2019).

The healthcare context was particularly relevant because DT can affect professional work practices, decision-making processes, and the relationship between technology and care delivery. Healthcare professionals increasingly work with digital systems, such as electronic health records, workflow systems, and decision-support tools, while maintaining responsibilities related to clinical judgment, patient safety, autonomy, and quality of care. Because technological change can differ substantially across sectoral and organizational contexts, focusing on healthcare allowed this study to examine technology adoption within one concrete professional context. This provided a relatively homogeneous sample in which professionals faced comparable digital demands and professional tensions, making healthcare a methodologically suitable context for examining the study's constructs.

3.2 Participants and procedure

Recruitment and sampling

Respondents were recruited through LinkedIn, M&I/Partners' professional healthcare network, hospital contacts, alumni groups, intranet posts within healthcare organizations, and physical QR-code recruitment in healthcare settings. Because respondents were recruited through accessible professional networks, the study used convenience sampling, meaning that participants were selected based on their availability and accessibility to the researcher rather than through random selection (Etikan et al., 2016). In addition, respondents were encouraged to share the survey with other healthcare professionals who met the inclusion criteria. This means that snowball sampling was also used, as existing respondents or contacts could help recruit additional participants from their professional networks (Parker et al., 2019).

Ethical approval and inclusion criteria

Prior to data collection, the study was reviewed and approved by the Ethics Committee of Vrije Universiteit Amsterdam. Data were collected through an online survey administered in Qualtrics. Before entering the survey, participants received an informed consent statement explaining the purpose of the study, voluntary participation, their right to withdraw, and the confidential handling of their responses. At the start of the survey, respondents were screened based on two inclusion criteria. First, they had to work with digital systems or tools in their daily work, as the study focused on technology adoption during DT. Second, they had to have a direct supervisor, because the study examined perceptions of paradoxical leadership. Respondents who answered “no” to either screening question were automatically redirected to the end of the survey and were therefore not able to complete the full questionnaire.

Data screening

The raw dataset consisted of 308 started survey responses. One respondent was excluded because informed consent was not provided. Responses with only screening-level progress and no usable substantive data were excluded, resulting in 239 responses. Subsequently, 16 respondents who indicated that they did not work with digital systems or tools and 42 respondents who indicated that they did not have a direct supervisor were excluded based on the inclusion criteria. An instructed-response attention check asked respondents to select “agree,” as failed attention checks may indicate lower survey data quality (Gummer et al., 2021). Seven respondents were excluded because they failed this attention check. Finally, two respondents were excluded because they provided insufficient substantive data. This resulted in a final analytical dataset of 172 respondents (response rate 55.8%).

Participant characteristics

The final analytical sample was described using demographic and professional background variables, although valid responses varied across variables. Gender was reported by 141 respondents. The sample was predominantly female, with 120 respondents coded as female (85.1%) and 21 respondents coded as male (14.9%). Age was reported by 137 respondents, with an average age of 31.16 years (*SD* = 11.35), ranging from 19 to 64 years. Years of professional healthcare experience was reported by 141 respondents, with an average of 9.31 years (*SD* = 9.46), ranging from 0.50 to 40.00 years. Most respondents were nurses (58.9%), followed by respondents in other healthcare roles (19.9%), allied health professionals (9.2%), administrative or support staff (7.1%), and physicians (5.0%). In terms of education, most respondents had completed a bachelor’s degree at HBO or WO level (50.7%), followed by secondary or vocational education at MBO level (28.6%) and a master’s degree at HBO or WO level (18.6%). Most respondents had worked with their current supervisor for one to three years (37.6%). Categorical sample frequencies are presented in Table A1 (Appendix A).

3.3 Measures

All constructs were measured using existing scales that were adapted where necessary to fit the context of DT in healthcare. Items were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Composite scores were created by averaging the relevant items, with higher scores indicating higher levels of the construct. Internal consistency was assessed using Cronbach's alpha, with values of .70 or higher generally considered acceptable for research purposes (Nunnally & Bernstein, 1994). Cronbach's alpha is reported for each multi-item scale below.

Technology adoption

Technology adoption was measured as two related but distinct outcomes: *technology adoption intention* and *self-reported technology use*. Respondents answered these items with reference to the digital systems and tools they use in their daily work, such as electronic health records, digital workflow systems, or decision-support tools. *Technology adoption intention* was measured with three items adapted from Venkatesh et al. (2003), including "I intend to use digital systems and tools in my daily work whenever appropriate" (Cronbach's α = .83). *Self-reported technology use* was measured with three items adapted from Tang et al. (2022), including "I use digital systems and tools to carry out most of my job functions" (Cronbach's α = .69, slightly below the conventional .70 threshold). Because the original items focused on artificial intelligence and one adapted item captured decision-making support more specifically, the scale may have reflected slightly broader aspects of digital technology use, which may explain the lower reliability. As the items were theoretically aligned and item removal would have reduced the scale to two items, the full three-item composite was retained. Separate composite scores were created for technology adoption intention and self-reported technology use.

Paradoxical leadership

Paradoxical leadership was measured using the five-item PLB-5 scale developed by Fürstenberg et al. (2021), based on Zhang et al.'s (2015) original 22-item paradoxical leadership behavior scale. Respondents evaluated their direct supervisor. An example item is: "My supervisor controls important work issues, but allows subordinates to handle details." Although the five items capture different aspects of paradoxical leader behavior, they were averaged into one overall score because the PLB-5 is designed as a brief measure of general paradoxical leadership (Cronbach's α = .84).

Psychological safety

Psychological safety was measured using Edmondson's (1999) seven-item team psychological safety scale. Respondents evaluated the team they worked with most frequently. Although the scale was originally developed to assess psychological safety as a shared team-level climate, psychological safety has also been examined as individually held perceptions within teams and organizations (Newman et al., 2017). Because respondents in this study were not nested within verified team-level clusters, responses were analyzed at the individual level. An example item is: "It is safe to take a risk on this team." Items 1, 3, and 5 were negatively worded and reverse coded before computing the composite score (Cronbach's α = .73).

Professional role identity threat

Professional role identity threat was measured using seven adapted items based on the identity threat dimensions reported by Jussupow et al. (2022). The items captured perceived threats to professional expertise and recognition, autonomy and control, and the care provider role. Because the original study focused on a specific AI system and physicians, the items were generalized to digital systems and digital workflows and phrased in the first person. An example item is: "I fear that when using these digital systems, my professional expertise may be valued less" (Cronbach's α = .86).

Organizational learning climate

Organizational learning climate was included as an exploratory contextual variable and measured with three subdimensions from Nikolova et al.'s (2014) Learning Climate Scale. *Learning resources* captured perceived organizational support for learning; e.g., "My organization provides sufficient resources to develop my competences" (α = .77). *Learning rewards* captured whether learning and professional development were valued; e.g., "In my organization, employees who make effort to learn new things, earn appreciation and respect" (α = .73). *Error non-avoidance* captured whether mistakes and work-related problems were discussed rather than avoided or suppressed; e.g., "In my organization, employees do not dare to discuss mistakes" (α = .78). The error avoidance items were reverse coded (higher scores = greater error non-avoidance). Composite scores were created for each subdimension.

Potential control variables

Based on prior research, age, educational qualification, years of professional healthcare experience, and experience under the current leader were considered as potential control variables, as these characteristics may influence technology acceptance, digital competence, responses to digital change, and perceptions of leadership (Venkatesh et al., 2003; Erfani et al., 2025). Age and years of professional healthcare experience were measured using open numeric fields. Educational qualification was measured categorically with the response options secondary/vocational education or MBO diploma, bachelor’s degree at HBO or WO level, master’s degree at HBO or WO level, PhD/doctorate, other, and prefer not to say. Experience under the current leader was measured categorically with the response options less than 6 months, 6 to 12 months, 1 to 3 years, 3 to 5 years, and more than 5 years. Following recommendations on the use of statistical controls, these variables were evaluated before inclusion in the main analyses rather than included automatically (Becker, 2005; Becker et al., 2016).

3.4 Analytical strategy

All analyses were conducted in JASP version 0.19.6.0. Descriptive statistics and Pearson correlations were computed for all study variables, including the potential control variables. Educational qualification and experience under the current leader were treated as ordinal variables, as their categories reflected an ordered progression in educational attainment and tenure, respectively. One non-disclosed education response was treated as missing in models including educational qualification as a covariate.

An exploratory factor analysis (EFA) was conducted to examine whether the survey items reflected empirically distinguishable constructs before testing the hypotheses using composite scores. In line with the theoretical structure of the study, a five-factor solution was specified. The EFA was based on the correlation matrix and estimated using minimum residual extraction. Because the constructs were theoretically expected to be related, an oblimin rotation was applied, as oblique rotation is recommended when factors are expected to correlate (Fabrigar et al., 1999; Costello & Osborne, 2005). Missing values were handled using pairwise deletion. Factor loadings of .30 or higher were considered meaningful, while loadings around .40 or higher were interpreted as more substantial (Hair et al., 2019). The hypotheses were tested using Hayes’ PROCESS Model 6 with 5,000 bootstrap samples and 95% confidence intervals (Preacher & Hayes, 2008; Hayes, 2022).

The model was estimated separately for technology adoption intention and self-reported technology use. In both models, paradoxical leadership was specified as the independent variable, psychological safety as the first mediator, and professional role identity threat as the second mediator. The regression paths estimated within PROCESS Model 6 were used to evaluate H2, H3, H4a, and H4b. The total effects were used to evaluate H1a and H1b, and the sequential indirect effects were used to evaluate H5a and H5b. Indirect effects were considered significant when the 95% bootstrap confidence interval did not include zero.

4. Results

4.1 Descriptive statistics and correlations

Means, standard deviations, reliability estimates, and Pearson correlations are presented in Table 1. The correlations showed several patterns relevant to the hypothesized model. Paradoxical leadership was positively associated with psychological safety ($r = .39$, $p < .001$). Psychological safety was negatively associated with professional role identity threat ($r = -.28$, $p < .001$) and self-reported technology use ($r = -.23$, $p < .01$), but was not significantly associated with technology adoption intention. Professional role identity threat was negatively associated with technology adoption intention ($r = -.29$, $p < .001$), but was not significantly associated with self-reported technology use. Technology adoption intention and self-reported technology use were positively associated ($r = .34$, $p < .001$), which is consistent with the treatment of these outcomes as related but empirically distinct constructs.

Following best-practice recommendations on statistical controls, potential control variables were evaluated based on their conceptual relevance and empirical associations with the dependent variables (Becker, 2005; Becker et al., 2016). Only educational qualification was significantly associated with technology adoption intention ($r = .19$, $p < .05$) and was therefore included as a control variable in the sequential mediation model predicting technology adoption intention. No control variables were included in the model predicting self-reported technology use.

Table 1
Means, standard deviations, reliabilities, and correlations among study variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	31.16	11.35	—											
2. Educational qualification	1.94	0.75	-.04	—										
3. Professional healthcare experience	9.31	9.46	.90***	-.05	—									
4. Experience under current leader	2.90	1.27	.38***	-.08	.38***	—								
5. Paradoxical leadership	3.63	0.79	.03	.22**	.02	-.03	(.84)							
6. Psychological safety	3.71	0.60	.03	.06	.05	-.04	.39***	(.73)						
7. Professional role identity threat	2.22	0.68	.01	-.10	.01	-.07	.04	-.28***	(.86)					
8. Technology adoption intention	4.22	0.56	-.03	.19*	.05	.07	.11	-.03	-.29***	(.83)				
9. Self-reported technology use	3.52	0.80	.03	.01	.10	.15	-.11	-.23**	.03	.34***	(.69)			
10. Learning rewards	3.15	0.76	.03	.17*	.01	-.07	.35***	.13	.05	-.04	-.03	(.73)		
11. Learning resources	3.66	0.72	.02	.16	.04	-.14	.36***	.24**	.01	.17*	.09	.46***	(.77)	
12. Error non-avoidance	3.59	0.76	.11	-.09	.14	.02	.15	.65***	-.34***	-.02	-.17	.13	.09	(.78)

Note. Cronbach's α values are shown on the diagonal in parentheses. Due to missing values, N varies between 137 and 172. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

4.2 Exploratory factor analysis

An exploratory factor analysis (EFA) was conducted to examine whether the survey items reflected empirically distinguishable constructs. Before interpreting the factor solution, the suitability of the data for factor analysis was assessed. The Kaiser-Meyer-Olkin measure of sampling adequacy was .77, exceeding the commonly used minimum criterion of .60 and indicating that the shared variance among items was sufficient for factor analysis (Kaiser, 1974). Bartlett's test of sphericity was significant, $\chi^2(300) = 1786.60$, $p < .001$, indicating that the correlation matrix differed significantly from an identity matrix and was therefore factorable (Bartlett, 1954). In line with the theoretical structure of the study, a theoretically informed five-factor solution was specified using minimum residual extraction and oblimin rotation, as the constructs were expected to be related (Fabrigar et al., 1999; Costello & Osborne, 2005). Together, the five factors explained 48.9% of the variance. Overall, the factor solution supported the empirical distinction between the five main constructs. Items loaded primarily on their theoretically expected factors, although some items showed modest loadings or cross-loadings (see Table B1 in Appendix B). Despite these imperfections, the primary loading pattern, reliability pattern, and theoretical basis of the scales supported retaining the composite scores for the subsequent hypothesis tests.

4.3 Sequential mediation model predicting technology adoption intention

PROCESS Model 6 was used to examine the sequential mediation model predicting technology adoption intention. In this model, paradoxical leadership was specified as the independent variable, psychological safety as the first mediator, professional role identity threat as the second mediator, and technology adoption intention as the dependent variable. Educational qualification was included as an ordinal covariate. The regression paths are presented in Table 2, and the total, direct, and indirect effects are presented in Table 3.

H1a predicted that paradoxical leadership would be positively associated with technology adoption intention. As shown in Table 3, the total effect of paradoxical leadership on technology adoption intention was not significant, $B = .043$, SE = .063, 95% CI [-.117, .231], $p = .498$. Therefore, H1a was not supported. The direct effect of paradoxical leadership on technology adoption intention also remained non-significant after including psychological safety, professional role identity threat, and educational qualification, $B = .092$, SE = .064, 95% CI [-.065, .280], $p = .151$.

H2 predicted that paradoxical leadership would be positively associated with psychological safety. As shown in Table 2, this path was positive and significant, $B = .245$, SE = .061, $p < .001$, supporting H2. H3 predicted that psychological safety would be negatively associated with professional role identity threat. This path was negative and significant while controlling for paradoxical leadership, $B = -.401$, SE = .100, $p < .001$, supporting H3. Notably, the direct path from paradoxical leadership to professional role identity threat was positive when psychological safety was included in the model, $B = .160$, SE = .077, $p = .037$. H4a predicted that professional role identity threat would be negatively associated with technology adoption intention. This path was negative and significant while controlling for paradoxical leadership, psychological safety, and educational qualification, $B = -.261$, SE = .068, $p < .001$, supporting H4a.

H5a predicted that psychological safety and professional role identity threat would sequentially mediate the relationship between paradoxical leadership and technology adoption intention. As shown in Table 3, the total indirect effect, representing the sum of the three specific indirect pathways through psychological safety only, through professional role identity threat only, and through both mediators sequentially, was not significant, $B = -.050$, SE = .030, 95% CI [-.121, .004], $p = .095$. The specific indirect effect through psychological safety only was also not significant, $B = -.033$, SE = .023, 95% CI [-.089, .003], $p = .139$. Similarly, the specific indirect effect through professional role identity threat only was not significant, $B = -.042$, SE = .023, 95% CI [-.101, .000], $p = .067$. However, the hypothesized sequential indirect effect through both psychological safety and professional role identity threat was significant, *B* = .026, SE = .011, 95% CI [.009, .060], *p* = .023. Therefore, H5a received support specifically at the level of the proposed sequential indirect pathway. This indicates that paradoxical leadership was indirectly associated with technology adoption intention through psychological safety and professional role identity threat in sequence, rather than through either mediator separately.

Table 2

Sequential mediation analysis predicting technology adoption intention

Dependent variable	**Independent variable**	R^2	*B*	**SE**	*β*	*z*	*p*
Psychological safety	Paradoxical leadership	.103	.245	.061	.320	4.001	< .001
Professional role identity threat	Paradoxical leadership	.107	.160	.077	.176	2.085	.037
Professional role identity threat	Psychological safety		-.401	.100	-.337	-3.997	< .001
Technology adoption intention	Paradoxical leadership	.118	.092	.064	.125	1.434	.151
Technology adoption intention	Psychological safety		-.136	.086	-.141	-1.593	.111
Technology adoption intention	Professional role identity threat		-.261	.068	-.321	-3.826	< .001
Technology adoption intention	Educational qualification		.101	.061	.135	1.662	.097

Note. $N = 140$. R^2 is reported once for each dependent variable equation. Educational qualification was included as an ordinal covariate in the model predicting technology adoption intention.

Table 3

Total, direct, and indirect effects of paradoxical leadership on technology adoption intention via psychological safety and professional role identity threat

Path	*B*	*SE*	*z*	*p*	**95% CI**
Total effect	.043	.063	.677	.498	[-.117, .231]
Direct effect	.092	.064	1.434	.151	[-.065, .280]
Total indirect effect	-.050	.030	-1.671	.095	[-.121, .004]
Paradoxical leadership → Psychological safety → Technology adoption intention	-.033	.023	-1.480	.139	[-.089, .003]
Paradoxical leadership → Professional role identity threat → Technology adoption intention	-.042	.023	-1.831	.067	[-.101, .000]
Paradoxical leadership → Psychological safety → Professional role identity threat → Technology adoption intention	.026	.011	2.274	.023	[.009, .060]

Note. $N = 140$. Bootstrap sample size = 5,000. SE = standard error. CI = 95% bias-corrected percentile bootstrap confidence interval. Educational qualification was included as an ordinal covariate predicting technology adoption intention.

4.4 Sequential mediation model predicting self-reported technology use

A second PROCESS Model 6 analysis was conducted to examine the sequential mediation model predicting self-reported technology use. In this model, paradoxical leadership was specified as the independent variable, psychological safety as the first mediator, professional role identity threat as the second mediator, and self-reported technology use as the dependent variable. No covariates were included in this model. The regression paths are presented in Table 4, and the total, direct, and indirect effects are presented in Table 5.

H1b predicted that paradoxical leadership would be positively associated with self-reported technology use. As shown in Table 5, the total effect of paradoxical leadership on self-reported technology use was not significant, $B = -.121$, SE = .088, 95% CI [-.299, .062], $p = .167$. Therefore, H1b was not supported. The direct effect of paradoxical leadership on self-reported technology use also remained non-significant after including psychological safety and professional role identity threat, $B = -.047$, SE = .091, 95% CI [-.231, .144], $p = .610$.

H2 predicted that paradoxical leadership would be positively associated with psychological safety. As shown in Table 4, this path was positive and significant, $B = .243$, SE = .061, $p < .001$, further supporting H2. H3 predicted that psychological safety would be negatively associated with professional role identity threat. This path was negative and significant while controlling for paradoxical leadership, $B = -.368$, SE = .097, $p < .001$, further supporting H3. H4b predicted that professional role identity threat would be negatively associated with self-reported technology use. This path was not significant while controlling for paradoxical leadership and psychological safety, $B = -.035$, SE = .099, $p = .724$. Therefore, H4b was not supported.

H5b predicted that psychological safety and professional role identity threat would sequentially mediate the relationship between paradoxical leadership and self-reported technology use. As shown in Table 5, the total indirect effect was significant, $B = -.075$, SE = .036, 95% CI [-.173, -.009], $p = .038$. This effect was mainly reflected in the specific indirect effect through psychological safety only, which was significant and negative, $B = -.073$, SE = .035, 95% CI [-.171, -.013], $p = .036$. The specific indirect effect through professional role identity threat only was not significant, $B = -.005$, SE = .014, 95% CI [-.049, .017], $p = .729$. However, the hypothesized sequential indirect effect through both psychological safety and professional role identity threat was not significant, $B = .003$, SE = .009, 95% CI [-.013, .025], $p = .726$. Therefore, H5b was not supported, because the proposed sequential indirect pathway was not significant.

Table 4

Sequential mediation analysis predicting self-reported technology use

Dependent variable	Independent variable	R^2	*B*	SE	*β*	*z*	*p*
Psychological safety	Paradoxical leadership	.098	.243	.061	.312	3.973	< .001
Professional role identity threat	Paradoxical leadership	.092	.134	.075	.147	1.774	.076
Professional role identity threat	Psychological safety		-.368	.097	-.316	-3.808	< .001
Self-reported technology use	Paradoxical leadership	.053	-.047	.091	-.044	-.511	.610
Self-reported technology use	Psychological safety		-.300	.122	-.219	-2.465	.014
Self-reported technology use	Professional role identity threat		-.035	.099	-.030	-.353	.724

Note. $N = 146$. R^2 is reported once for each dependent variable equation.

Table 5

Total, direct, and indirect effects of paradoxical leadership on self-reported technology use via psychological safety and professional role identity threat

Path	*B*	SE	*z*	*p*	95% CI
Total effect	-.121	.088	-1.382	.167	[-.299, .062]
Direct effect	-.047	.091	-.511	.610	[-.231, .144]
Total indirect effect	-.075	.036	-2.076	.038	[-.173, -.009]
Paradoxical leadership → Psychological safety → Self-reported technology use	-.073	.035	-2.095	.036	[-.171, -.013]
Paradoxical leadership → Professional role identity threat → Self-reported technology use	-.005	.014	-.346	.729	[-.049, .017]
Paradoxical leadership → Psychological safety → Professional role identity threat → Self-reported technology use	.003	.009	.350	.726	[-.013, .025]

Note. $N = 146$. Bootstrap sample size = 5,000. SE = standard error. CI = 95% bias-corrected percentile bootstrap confidence interval.

4.5 Exploratory parallel mediation analyses

To further examine potential explanatory mechanisms beyond the hypothesized sequential pathway, two exploratory parallel mediation analyses were conducted using the organizational learning climate dimensions: learning rewards, learning resources, and error non-avoidance (Nikolova et al., 2014). These analyses were motivated by two observations. First, paradoxical leadership was positively associated with learning rewards ($r = .35$, $p < .001$) and learning resources ($r = .36$, $p < .001$) in the correlation analysis, and learning resources was also positively associated with technology adoption intention ($r = .17$, $p < .05$). Second, the main sequential model predicting self-reported technology use explained relatively limited variance (R^2 = .053), suggesting that additional mechanisms beyond the hypothesized sequential pathway may be relevant for understanding this outcome.

These learning climate dimensions were examined using PROCESS Model 4 with 5,000 bootstrap samples to assess their unique indirect associations with both adoption outcomes, while controlling for psychological safety and professional role identity threat as additional parallel mediators (Hayes, 2022). The first model predicted technology adoption intention and the second model predicted self-reported technology use. Because these analyses were exploratory, results are reported as additional patterns rather than formal hypothesis tests. The corresponding path coefficients are presented in Table C1 (Appendix C), while the total, direct, and indirect effects are presented in Table 6.

Across both exploratory models, paradoxical leadership was consistently positively associated with psychological safety (*B* = .243), learning rewards (*B* = .359), and learning resources (*B* = .348), all $p < .001$. In contrast, paradoxical leadership was not significantly associated with professional role identity threat or error non-avoidance in either model.

The mediator-to-outcome paths showed different patterns for the two outcomes. In the model predicting technology adoption intention, professional role identity threat was negatively associated with intention (*B* = -.290, $p < .001$), while learning resources was positively associated with intention (*B* = .179, *p* = .006). The remaining mediator-to-outcome paths and the direct association between paradoxical leadership and technology adoption intention were not significant. This model explained 20.9% of the variance in technology adoption intention. In the model predicting self-reported technology use, psychological safety was negatively associated with use (*B* = -.308, *p* = .010), while learning resources was positively associated with use (*B* = .232, *p* = .018). The remaining mediator-to-outcome paths and the direct association between paradoxical leadership and self-reported technology use were not significant. This model explained 9.7% of the variance in self-reported technology use.

The indirect effects further suggested that learning resources may be the most relevant organizational learning climate dimension in these exploratory models. For technology adoption intention, the total indirect effect was not significant (*B* = -.034, 95% CI [-.130, .056], *p* = .474). However, the specific indirect effect through learning resources was significant (*B* = .062, 95% CI [.004, .129], *p* = .017). For self-reported technology use, the total indirect effect was not significant (*B* = -.025, 95% CI [-.150, .093], *p* = .697). However, the specific indirect effect through learning resources was significant (*B* = .081, 95% CI [.006, .176], *p* = .035). The specific indirect effect through psychological safety in the self-reported technology use model had a significant p-value (p = .031), but its 95% bootstrap confidence interval included zero [-.187, .020]; therefore, it was not interpreted as significant. The remaining specific indirect effects were not significant.

Table 6

Total, direct, and indirect effects in the exploratory parallel mediation analyses

Outcome	Effect/path	*B*	SE	*p*	95% CI
Intention	Total effect	.067	.065	.302	[-.087, .238]
Intention	Direct effect	.101	.069	.144	[-.059, .280]
Intention	Total indirect effect	-.034	.048	.474	[-.130, .056]
Intention	PL → PS → intention	-.033	.021	.115	[-.092, .017]
Intention	PL → IT → intention	-.017	.023	.450	[-.069, .039]
Intention	PL → learning rewards → intention	-.039	.023	.096	[-.107, .017]
Intention	PL → learning resources → intention	.062	.026	.017	[.004, .129]
Intention	PL → error non-avoidance → intention	-.007	.009	.430	[-.051, .021]
Use	Total effect	-.119	.091	.192	[-.298, .079]
Use	Direct effect	-.094	.104	.366	[-.297, .114]
Use	Total indirect effect	-.025	.063	.697	[-.150, .093]
Use	PL → PS → use	-.075	.035	.031	[-.187, .020]
Use	PL → IT → use	-.003	.007	.635	[-.029, .023]
Use	PL → learning rewards → use	-.021	.033	.522	[-.104, .047]
Use	PL → learning resources → use	.081	.038	.035	[.006, .176]
Use	PL → error non-avoidance → use	-.006	.013	.652	[-.071, .040]

Note. N = 141 for both models. PL = paradoxical leadership; PS = psychological safety; IT = professional role identity threat; intention = technology adoption intention; use = self-reported technology use. Bootstrap sample size = 5,000. No covariates were included. For indirect effects, statistical inference was based on the 95% bootstrap confidence intervals.

5. Discussion

This study examined how paradoxical leadership influences technology adoption among healthcare professionals during DT. More specifically, it tested whether psychological safety and professional role identity threat sequentially mediate the relationship between paradoxical leadership and two adoption outcomes: technology adoption intention and self-reported technology use. Overall, the findings provide partial support for the proposed model. Rather than directly predicting technology adoption outcomes, paradoxical leadership appeared to matter through an indirect psychological pathway that was relevant specifically for technology adoption intention. Paradoxical leadership was associated with higher psychological safety, which was associated with lower professional role identity threat, which in turn was associated with higher technology adoption intention. This suggests that paradoxical leadership may shape professionals' willingness to adopt digital technologies by creating psychological conditions in which DT feels less threatening to professional role identity. However, this pathway did not explain self-reported technology use, suggesting that adoption intention and self-reported use may be shaped by different mechanisms. This distinction is further nuanced by two unexpected findings: in the intention model, paradoxical leadership showed a positive direct association with professional role identity threat, while psychological safety was negatively associated with self-reported technology use. Together, these findings indicate that the relationship between leadership, professional identity, and technology adoption is more complex than initially theorized.

5.1 Theoretical implications

The findings provide several theoretical implications for understanding how paradoxical leadership shapes technology adoption in healthcare DT. First, paradoxical leadership may matter less as a direct predictor of technology adoption and more as an indirect, enabling approach that helps create conditions in which adoption-related tensions can be discussed, processed, and experienced as less threatening. This is supported by the significant sequential pathway from paradoxical leadership to technology adoption intention through psychological safety and professional role identity threat. The absence of direct associations with technology adoption intention and self-reported technology use is therefore not necessarily surprising. Technology adoption in healthcare is shaped by interactions between multiple factors, including the technology itself, its adopters, organizational conditions, and broader context (Greenhalgh et al., 2017). Recent healthcare evidence supports this view by showing that adoption of digital nursing technologies depends on conditions such as leadership support, training, workflow fit, and concerns about professional role and autonomy (Walzer et al., 2025). Against this background, paradoxical leadership alone may be too distal to directly determine technology adoption outcomes, making the relational and psychological mechanisms through which professionals interpret digital change theoretically more relevant.

Second, the findings extend psychological safety research in two ways. First, the positive association between paradoxical leadership and psychological safety extends prior research conducted mainly in Chinese organizational contexts and Turkish manufacturing settings (Xue et al., 2020; Yu et al., 2025; Sürücü et al., 2025), responding to calls to examine this relationship in different cultural and sectoral contexts. Second, the findings suggest that psychological safety may extend beyond its established role in enabling voice and interpersonal risk-taking to also shape how professionals experience threats to their professional role identity during DT. This broadens the relevance of psychological safety in healthcare, where feeling able to speak up depends on leadership, interpersonal relationships, and perceptions of being valued (O'Donovan et al., 2021). Such conditions are especially important during DT, because digital technologies can affect professional identity, autonomy, moral agency, patient-centred care, and power relations in clinical work (Knop et al., 2024). Professionals who perceive their team as psychologically safe may therefore be better able to discuss and make sense of digital technologies in relation to their expertise, autonomy, and care provider role, rather than experiencing them as immediately incompatible with professional work.

Third, two unexpected findings add nuance to the proposed model. First, in the model predicting technology adoption intention, paradoxical leadership showed a positive direct association with professional role identity threat, suggesting that paradoxical leadership may not only reduce tensions indirectly through psychological safety, but also make such tensions more visible. This aligns with paradox research suggesting that engaging with paradoxes requires recognizing and cognitively processing competing demands rather than removing them (Miron-Spektor et al., 2018). Second, the negative association between psychological safety and self-reported technology use challenges the assumption that psychological safety automatically leads to greater use. Because psychological safety enables professionals to voice concerns and discuss uncertainties (O'Donovan et al., 2021), they may use digital technologies more critically or selectively when these systems do not fit professional judgment, workflow needs, or patient care priorities. In doing so, this finding contributes to Newman et al.'s (2017) call for greater investigation of the potential negative effects of psychological safety. Together, these two unexpected findings suggest that paradoxical leadership and psychological safety may not simply reduce tensions or increase technology use, but may also enable a more critical and selective engagement with DT among healthcare professionals.

Fourth, the findings reinforce the theoretical distinction between technology adoption intention and self-reported technology use. While conceptually distinct (Venkatesh et al., 2003), these outcomes appeared to be shaped by different mechanisms. Professional role identity threat was negatively associated with technology adoption intention, but not with self-reported technology use. This suggests that professional role identity threat may be a central psychological barrier to technology adoption intention in healthcare DT, particularly when digital systems are perceived to challenge professional expertise, autonomy, or the care provider role. Self-reported technology use, by contrast, may depend more strongly on whether digital systems are sufficiently supported, usable, and embedded in everyday healthcare work (May & Finch, 2009).

The exploratory findings on learning resources provide tentative support for this implementation-oriented interpretation. Learning resources were positively associated with both technology adoption intention and self-reported technology use, and showed significant specific indirect pathways from paradoxical leadership to both outcomes. Consistent with organizational learning climate theory (Nikolova et al., 2014), this suggests that learning resources may represent an additional mechanism through which paradoxical leadership becomes relevant for technology adoption outcomes, by helping professionals develop the competences needed to incorporate digital technologies into everyday work. This aligns with recent healthcare implementation research showing that training, workflow alignment, and organizational support are particularly important for translating adoption intention into meaningful use in practice (Walzer et al., 2025). Together, these findings suggest that technology adoption in healthcare should be understood not only as a psychological acceptance process, but also as an organizationally embedded learning and implementation process.

5.2 Practical implications

Beyond these theoretical contributions, the findings provide several practical implications for healthcare organizations and managers involved in DT. First, managers should apply paradoxical leadership behaviors carefully when helping professionals navigate the tensions that DT creates, rather than simply encouraging adoption. The practical value of paradoxical leadership may instead lie in helping professionals make sense of competing demands. At the same time, managers should recognize that this process can also make identity-relevant tensions more visible. For example, explicitly emphasizing both digital innovation and professional discretion may increase professionals' awareness that digital systems could affect valued aspects of their role. Managers should therefore provide sensegiving communication that explains why these demands are present and how they can be balanced in daily work (Sparr et al., 2022). In particular, managers should clarify how digital tools are intended to support, rather than replace, professional judgment and patient-centred care, given that digital technologies may restructure professional-patient relationships and raise concerns about autonomy and expertise (Funer et al., 2024).

Second, healthcare organizations should create psychologically safe and identity-sensitive implementation processes. The findings suggest that when professionals feel able to voice concerns, ask questions, and discuss uncertainties without fear of negative consequences, DT may be less likely to be experienced as a threat to their professional role identity. Psychological safety should therefore not be treated as an end in itself, but as an interpersonal climate that enables professionals to openly discuss how digital systems affect their work (Edmondson & Bransby, 2023). Managers should actively invite professionals to reflect on how these systems shape their expertise, autonomy, professional judgment, and care provider role. This reflection should be embedded in implementation processes that help professionals identify where digital systems support their work, where they create tensions, and what workflow adjustments are needed (Greenhalgh et al., 2017; Ullrich et al., 2023).

Third, healthcare organizations should distinguish between creating willingness to adopt digital technologies and enabling technology use in daily practice. The supported sequential pathway for technology adoption intention suggests that this willingness is shaped by a psychological route through psychological safety and lower professional role identity threat. However, this pathway was not supported for self-reported technology use, suggesting that use may depend more on practical support and integration into healthcare work routines. The exploratory findings reinforce this implication, as learning resources appeared relevant for both technology adoption intention and self-reported technology use. Organizations should therefore invest in concrete implementation support, such as time to practise, accessible training, peer learning, user support, and workflow integration (Walzer et al., 2025). Still, implementation support alone may be insufficient, as suggested by the negative association between psychological safety and self-reported technology use. Rather than automatically leading to greater use, psychological safety may enable professionals to use digital technologies more critically or selectively when these systems do not align with workflow demands, professional judgment, or patient care needs. Managers should therefore treat critical feedback not as resistance by default, but as potentially useful information about usability, workflow fit, and the conditions needed for meaningful use (Ford et al., 2008).

5.3 Strengths, limitations, and future research

This study has several strengths. Theoretically, it integrates paradoxical leadership, psychological safety, professional role identity threat, and technology adoption into one sequential mediation model, examined in a focused healthcare DT context. This allowed the study to move beyond a direct relationship between leadership and technology adoption and to examine psychological and identity-related mechanisms that may explain how healthcare professionals respond to DT. A second strength is the distinction between technology adoption intention and self-reported technology use as separate outcomes, which proved theoretically and empirically relevant. Methodologically, the study used existing validated scales, adapted them carefully to fit the DT context, assessed internal consistency and factor structure, and tested indirect effects using bootstrapped confidence intervals. Finally, the exploratory analyses on organizational learning climate added depth to the study by pointing to learning resources as a potential organizational pathway for future research.

The findings should nonetheless be interpreted in light of several limitations. First, the proposed ordering of psychological safety before professional role identity threat is theoretically grounded, but was not empirically tested through temporal separation. Cross-sectional mediation models cannot establish the temporal ordering of mechanisms, making it possible that the relationship between psychological safety and professional role identity threat is reciprocal rather than strictly sequential (Cole & Maxwell, 2003). Relatedly, the cross-sectional design limits causal interpretation. Reverse relationships cannot be ruled out: professionals who experience lower professional role identity threat may also evaluate their team's psychological safety or their supervisor's paradoxical leadership more positively. Future longitudinal or time-lagged research could examine the causal ordering of these mechanisms more rigorously.

Second, all variables were measured using self-report questionnaires. This may introduce common method bias, especially because respondents evaluated their own technology use, their team climate, and their supervisor (Podsakoff et al., 2003). However, self-report measures were appropriate for several constructs in this study, as psychological safety, professional role identity threat, and technology adoption intention concern subjective perceptions and appraisals that are most directly accessible to respondents themselves (Conway & Lance, 2010). Future studies could combine survey data with more objective or behavioural indicators of technology adoption, such as system-use logs or implementation records, to more directly capture technology use behavior as conceptualized in UTAUT (Venkatesh et al., 2003).

Third, the use of convenience and snowball sampling, together with the composition of the sample, limits the representativeness of the study and restricts generalizability beyond the Dutch healthcare context. Because the sample was predominantly female and consisted largely of nursing professionals, the findings may not fully generalize to other healthcare professions or more gender-diverse samples. This limitation is also cultural and contextual, as professional norms, leadership expectations, hierarchy, and digital maturity may vary across healthcare systems, organizations, and countries (House et al., 2004). In more hierarchical or high-power-distance contexts, paradoxical leadership behaviors may, for example, be perceived or enacted differently, which could affect their association with psychological safety and technology adoption. Future research should therefore examine whether these mediation pathways hold across a broader range of healthcare professions, gender distributions, organizational settings, cultural contexts, and levels of digital maturity.

Fourth, several measurement and model-related limitations warrant attention. Psychological safety was measured as individual perceptions rather than as a shared team-level climate, because respondents were not nested within verified team-level clusters. Future studies could use multilevel designs to examine whether team-level psychological safety explains variance in professional role identity threat beyond individual perceptions. In addition, the self-reported technology use scale showed a Cronbach's alpha of .69, slightly below the conventional .70 threshold. This may partly reflect the adaptation of Tang et al.'s (2022) AI-specific items to a broader digital systems context. Similarly, the professional role identity threat scale was adapted from Jussupow et al.'s (2022) work on AI and physicians, which may have reduced construct specificity. Both scales warrant further validation across different digital technologies and professional groups.

Finally, the model predicting self-reported technology use explained only 5.3% of the variance, suggesting that technology use in healthcare practice may depend more strongly on factors beyond the proposed sequential pathway, such as usability, workflow fit, and implementation conditions. The exploratory findings on learning resources also deserve further attention. Although both specific indirect pathways through learning resources were significant, these findings remain exploratory and should be replicated in future research before stronger conclusions are drawn. Future research should therefore examine whether organizational learning climate, particularly learning resources, helps healthcare professionals develop both the willingness to adopt digital technologies and the practical capacity to use them meaningfully.

6. Conclusion

This study examined how paradoxical leadership influences technology adoption among healthcare professionals during digital transformation. The findings show that paradoxical leadership was not directly associated with technology adoption intention or self-reported technology use. Instead, its relevance lies in the psychological and relational conditions through which professionals interpret digital change. For technology adoption intention, the findings supported a sequential indirect pathway: paradoxical leadership was positively associated with psychological safety, which was negatively associated with professional role identity threat, which in turn was negatively associated with technology adoption intention. This pathway was not supported for self-reported technology use, suggesting that self-reported technology use may depend more strongly on practical support, learning resources, workflow fit, and organizational embedding. Two unexpected findings further underline this complexity. In the intention model, paradoxical leadership showed a positive direct association with professional role identity threat, while psychological safety was negatively associated with self-reported technology use. Overall, this study shows that meaningful technology adoption in healthcare requires attention to both the psychological conditions that shape professionals' willingness to adopt and the organizational conditions that enable digital technologies to become integrated parts of everyday care.

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Appendix

Appendix A. Sample frequencies

Table A1

Frequencies of categorical sample characteristics

Characteristic	*N*	%
Gender		
Male	21	14.9
Female	120	85.1
Education		
Secondary/vocational education (MBO)	40	28.6
Bachelor's degree (HBO/WO)	71	50.7
Master's degree (HBO/WO)	26	18.6
PhD/doctorate	3	2.1
Professional role		
Physician	7	5.0
Nurse	83	58.9
Allied health professional	13	9.2
Administrative/support staff	10	7.1
Other healthcare role	28	19.9
Tenure under current supervisor		
Less than 6 months	24	17.0
6 to 12 months	26	18.4
1 to 3 years	53	37.6
3 to 5 years	16	11.3
More than 5 years	22	15.6

Note. Percentages are valid percentages and exclude missing values. For gender, professional role, and tenure under the current supervisor, 31 responses were missing. For education, 32 responses were missing because the categories "other" and "prefer not to say" were treated as missing for the cleaned categorical overview.

Appendix B. Exploratory factor analysis pattern matrix

Table B1

Exploratory factor analysis pattern matrix

Item	F1	F2	F3	F4	F5	Uniqueness
PL_1: My supervisor uses a fair approach to treat all subordinates uniformly, but also treats them as individuals.		.783				.364
PL_2: My supervisor shows a desire to lead, but allows others to share the leadership role.		.741				.415
PL_3: My supervisor controls important work issues, but allows subordinates to handle details.		.768				.421
PL_4: My supervisor is highly demanding regarding work performance, but is not hypercritical.		.547				.687
PL_5: My supervisor recognises the distinction between supervisors and subordinates, but does not act superior in the leadership role.		.684				.455
PS_1_R: If you make a mistake on this team, it is often held against you.				.338		.729
PS_2: Members of this team are able to bring up problems and tough issues.				.445		.687
PS_3_R: People on this team sometimes reject others for being different.				.645		.556
PS_4: It is safe to take a risk on this team.				.476		.657
PS_5_R: It is difficult to ask other members of this team for help.				.539		.607
PS_6: No one on this team would deliberately act in a way that undermines my efforts.				.436		.673
PS_7: Working with members of this team, my unique skills and talents are valued and utilized.		.330		.406		.608
IT_1: The use of these digital systems may lead me to lose my expert status.	.655					.582
IT_2: The use of these digital systems may reduce the value of my professional expertise.	.860					.311
IT_3: The use of these digital systems may lower my professional status.	.802					.387
IT_4: The use of these digital systems may reduce my job autonomy.	.586					.532
IT_5: The use of these digital systems may reduce my control over medical decisions for patients.	.414			-.330		.597
IT_6: The use of these digital systems may reduce my influence on patient care.	.512					.476
IT_7: The use of these digital systems may reduce my ability to treat my patients well.	.563			-.307		.469
TA_Int_1: I intend to use digital systems and tools in my daily work whenever appropriate.			.689			.495
TA_Int_2: I plan to actively use digital systems and tools in my daily work.			.818			.249
TA_Int_3: I predict that I will use digital systems and tools regularly in my daily work.			.796			.320
TA_Use_4: I spend most of my work time using digital systems and tools.					.696	.372
TA_Use_5: I use digital systems and tools to carry out most of my job functions.					.845	.279
TA_Use_6: I use digital systems and tools when making important work-related decisions.					.383	.849

Note. Extraction method was minimum residual. Rotation method was oblimin. Factor loadings below .30 are suppressed. F1 = professional role identity threat; F2 = paradoxical leadership; F3 = technology adoption intention; F4 = Psychological safety; F5 = self-reported technology use.

Appendix C. Path coefficients

Table C1

Path coefficients for the exploratory parallel mediation analyses

Outcome	Path	*B*	SE	*β*	*z*	*p*
Intention	PL → PS	.243	.062	.314	3.933	< .001
Intention	PL → IT	.059	.077	.064	.767	.443
Intention	PL → Learning rewards	.359	.080	.353	4.473	< .001
Intention	PL → Learning resources	.348	.075	.364	4.641	< .001
Intention	PL → Error non-avoidance	.146	.084	.145	1.736	.083
Intention	PL → Intention	.101	.069	.131	1.461	.144
Intention	PS → Intention	-.135	.079	-.136	-1.722	.085
Intention	IT → Intention	-.290	.063	-.346	-4.607	< .001
Intention	Learning rewards → Intention	-.108	.060	-.144	-1.794	.073
Intention	Learning resources → Intention	.179	.065	.222	2.766	.006
Intention	Error non-avoidance → Intention	-.051	.058	-.067	-.885	.376
Use	PL → PS	.243	.062	.314	3.933	< .001
Use	PL → IT	.059	.077	.064	.767	.443
Use	PL → Learning rewards	.359	.080	.353	4.473	< .001
Use	PL → Learning resources	.348	.075	.364	4.641	< .001
Use	PL → Error non-avoidance	.146	.084	.145	1.736	.083
Use	PL → Use	-.094	.104	-.087	-.905	.366
Use	PS → Use	-.308	.119	-.218	-2.588	.010
Use	IT → Use	-.058	.095	-.048	-.604	.546
Use	Learning rewards → Use	-.059	.092	-.055	-.646	.518
Use	Learning resources → Use	.232	.098	.204	2.369	.018
Use	Error non-avoidance → Use	-.041	.088	-.038	-.468	.640

Note. N = 141 for both models. PL = paradoxical leadership; PS = psychological safety; IT = professional role identity threat; intention = technology adoption intention; use = self-reported technology use. No covariates were included.

Appendix D. AI declaration

For this thesis, I used ChatGPT by OpenAI as a limited and supportive feedback tool. I used it to reflect on the structure, coherence, academic tone, and clarity of self-written parts of the thesis, particularly the introduction, discussion, conclusion, and abstract. ChatGPT was not used to collect data, generate survey responses, select or analyse literature, conduct statistical analyses, generate or verify references, or make research decisions.

Any feedback or formulation suggestions were critically reviewed and only used when they improved clarity, coherence, or academic readability without changing the meaning, interpretation, or theoretical nuance of the thesis. All theoretical argumentation, methodological choices, data screening, statistical analyses, interpretation of the findings, and final academic decisions were made by me, the author.