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Original Article

Strategic Human Resource Development in the Digital Age: A Mixed-Methods Investigation of Upskilling and Reskilling Program Effectiveness

Mr. Purushotham C J[1], Mr. Nagesh Yadav D N[2]
[1]Associate Professor & Research Supervisor, Department of Management Studies, Visvesvaraya Technological University-Belagavi, Centre for Post-Graduation Studies, Muddenahalli, Chikkaballapur, India
[2]Student, Department of Management Studies (MBA), Centre for Post Graduate Studies, Muddenahalli, fcChikkaballapur, Visvesvaraya Technological University. Belagavi. Karnataka State., India
Email: nageshyadavnagesh4@gmail.com

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Abstract

The efficacy of upskilling and reskilling programs in organizational digital transformation contexts is examined in this mixed-methods study. We looked into the connections between upskilling tactics organizational characteristics and program results using survey data from 342 HR professionals in 89 North American companies as well as qualitative case studies from 12 organizations. According to the results systematic upskilling methods and better results are significantly correlated (r = 52 p. 001) and organizational learning climate acts as a partial mediator (indirect effect = .28 95 percent CI [. [19 .38]. Technology readiness moderated these relationships (β = .21, p < .01). Four major success themes were identified through qualitative analysis: comprehensive measurement leadership commitment program customization and ongoing reinforcement. The geographic scope limits generalizability and the cross-sectional design limits causal inference. Results indicate that systematic workforce development strategies may be linked to improved organizational outcomes however causality must be established through longitudinal research.

Keywords: *workforce development organizational learning upskilling human resource development and mixed methods.*

Introduction

Workplace skill requirements have been drastically changed by digital transformation posing previously unheard-of difficulties for human resource development (HRD) professionals. 375 million workers worldwide may need to change occupational categories by 2030 according to the McKinsey Global Institute (2023) while the World Economic Forum (2023) predicts that 44% of worker skills will be disrupted by 2027. Studies indicate that 70% of training programs do not achieve the intended learning transfer despite significant organizational investments in workforce development which are estimated to be $366 billion worldwide in 2023 (Training Industry 2024). This failure rate shows a serious discrepancy between organizational investment and results indicating that traditional workforce development strategies might not be enough to meet todays skill demands. Even though there are many frameworks and best practices available in practitioner literature there is still a dearth of empirical research on the efficacy of various upskilling techniques especially in organizational contexts going through digital transformation.

Research Problem:

Organizations do not have empirically validated frameworks for planning and carrying out successful workforce development initiatives in digital transformation contexts despite significant investments in upskilling and reskilling interventions.

Address for correspondence:
Mr. Purushotham C J, Associate Professor & Research Supervisor, Department of Management Studies, Visvesvaraya Technological University-Belagavi, Centre for Post-Graduation Studies, Muddenahalli, Chikkaballapur, India

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By investigating the connections between organizational characteristics program efficacy and upskilling tactics this study fills this knowledge gap.

1 Research Objectives

This investigation addresses four primary research objectives:

1. **To examine the relationships between different upskilling strategies and program effectiveness outcomes.**
2. **To analyze how organizational learning climate factors influence upskilling program outcomes.**
3. **To investigate the role of organizational characteristics as moderators in the relationship between upskilling strategies and program effectiveness.**
4. **To explore the implementation practices and sustainability mechanisms of effective upskilling programs in successful organizations.**

2 Study Contributions

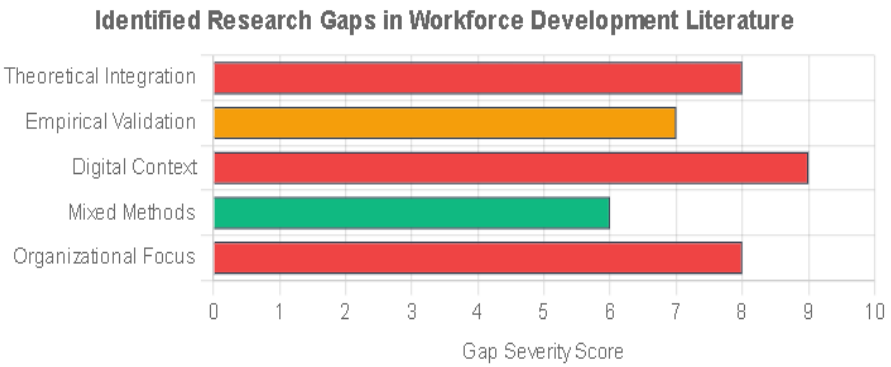
By (a) empirically examining the effectiveness of upskilling strategies using validated measurement tools (b) investigating organizational learning climate as a mediating mechanism (c) identifying contextual moderators influencing program success and (d) integrating quantitative and qualitative evidence to understand implementation processes this research advances HRD theory and practice.

Literature Review And Theoretical Framework

1 Evolution of Workforce Development Research

Early industrial training models that concentrated on skill acquisition gave way to more modern strategic HRD approaches that emphasize ongoing learning and flexibility in workforce development research (Noe et al. (2023). Numerous elements such as learner characteristics program design elements and organizational support systems have been linked to training effectiveness in recent meta-analyses (Blume et al. 2019 as well as Grossman and Salas (2011). The majority of current research however concentrates on conventional training environments rather than extensive organizational upskilling programs. Diverse learning needs quick skill obsolescence and complicated implementation requirements are some of the special difficulties brought about by digital transformation that traditional training research might not be able to handle (Cascio and Montealegre 2016).

Literature Review: Key Research Gaps



2 Theoretical Framework Development

This study integrates three theoretical perspectives to understand upskilling effectiveness:
According to Becker (1964) the economic basis is provided by **Human capital theory** which suggests that investments in employee skills yield returns through improved organizational performance and productivity. Research showing a favorable correlation between training expenditures and organizational results is considered empirical support (Tharenou et al. (2007)). With an emphasis on self-direction experience integration and practical application **Adult Learning Theory** provides design principles for successful adult education (Knowles et al. 2020). According to meta-analytic evidence programs that use andragogical principles produce better learning outcomes (Taylor and Kroth 2009). Environmental elements that facilitate learning activities are identified by the Organizational **Learning Climate Theory**. These elements include embedded learning systems inquiry and dialogue and a continuous learning orientation (Marsick & Watkins 2003). Significant connections between training transfer and learning climate have been shown by research (Burke & Hutchins 2007).

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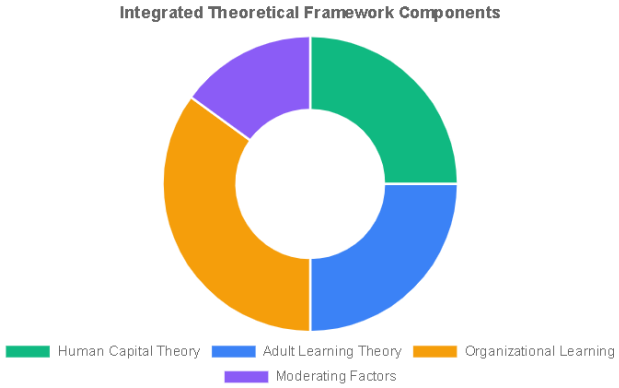
Proposed Theoretical Model

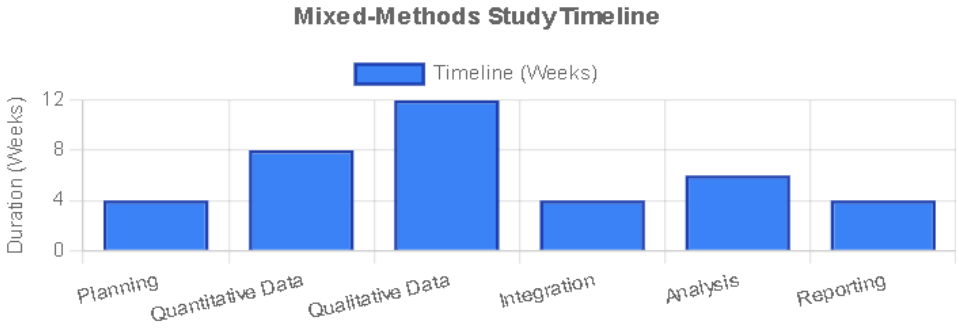


Methodology

1 Research Design

A concurrent mixed-methods design with a quantitative focus was used in this study (Creswell and Plano Clark 2018). Qualitative case studies investigating implementation procedures and contextual factors are integrated with survey research analyzing relationships among variables.

Research Design Overview



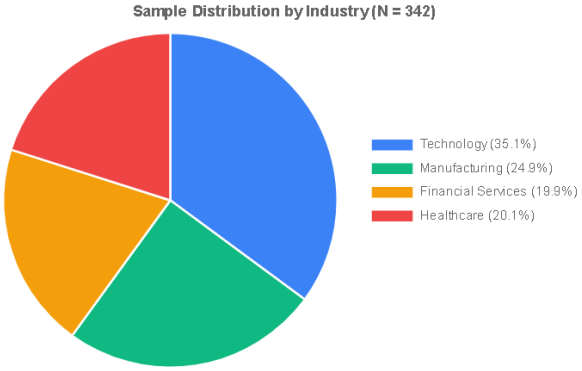
2 Quantitative Phase

Participants and Sampling: HR professionals directly involved in upskilling initiatives in North American companies with 100 or more employees made up the target population. Using stratified random sampling made sure that all industries and sizes of organizations were represented.

Sample Size: Power analysis (G*Power 3. 1). Using training research meta-analyses, the minimum required sample size was 277 participants (9. 7) with α = 05 power = 80 and an expected small-to-medium effect size (f^2 = .10). 450 people were recruited in order to account for incomplete responses.

342 people from 89 organizations made up the final sample (response rate = 68. 4%). A post-hoc power analysis verified that the detected effect sizes had sufficient power (1-β = .89).

Sample Characteristics



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Characteristic	Category	n	%	M (SD)
Industry	Technology	120	35.1	-
	Manufacturing	85	24.9	-
	Financial Services	68	19.9	-
	Healthcare	69	20.1	-
Organization Size	100-999 employees	137	40.1	-
	1000-4999 employees	120	35.1	-
	5000+ employees	85	24.9	-
HR Experience	Years in field	-	-	8.7 (4.2)
Training Budget	% of payroll	-	-	2.8 (1.4)

Measurement Instruments: All measures used established, validated scales with demonstrated reliability and validity in organizational contexts.

Construct	Scale	Items	α	Example Item	Response Scale
Upskilling Strategy	Developed for study	12	0.89	"Our organization uses systematic approaches to identify skill gaps"	7-point Likert
Learning Climate	DLOQ (Yang, 2003)	21	0.94	"People in this organization support each other's learning"	6-point Likert
Program Effectiveness	Adapted from Kirkpatrick	16	0.91	"Participants apply learned skills on the job"	7-point Likert
Technology Readiness	TRI-2.0 (Parasuraman, 2000)	8	0.85	"Our organization adopts new technologies quickly"	5-point Likert
Leadership Support	Developed for study	6	0.88	"Senior leaders actively support learning initiatives"	7-point Likert

3 Qualitative Phase

Case Selection: Based on quantitative composite scores 12 organizations representing high (n=4) medium (n=4) and low (n=4) effectiveness levels were chosen through purposive sampling. Program maturity (2+ years) stakeholder access and documentation availability were among the selection criteria.

Data Collection Method	Participants	Duration	Total
Leadership interviews	C-level executives, VP HR	60-90 minutes	24 interviews
HR professional interviews	Training managers, L&D specialists	45-60 minutes	36 interviews
Employee focus groups	Training participants	90 minutes	8 focus groups (48 participants)
Document analysis	Policies, training materials, metrics	Ongoing	156 documents

4 Data Analysis

In quantitative analysis SPSS 29 and PROCESS macro v4. 1 were used for initial data screening assumption testing and hypothesis evaluation.

Analysis Steps:

1. Missing data analysis and imputation (FIML method)
2. Outlier detection using Mahalanobis distance
3. Assumption testing (normality, linearity, homoscedasticity)
4. Common method bias assessment using CFA approach
5. Descriptive statistics and correlation analysis
6. Multiple regression for direct effects
7. Mediation analysis using PROCESS Model 4
8. Moderation analysis using PROCESS Model 1
9. Moderated mediation using PROCESS Model 7

Qualitative Analysis: NVivo 14s thematic analysis feature was used to examine interview transcripts and documents (Braun and Clarke 2006). Twenty percent inter-rater reliability checking (κ = . 87) open coding theme development and cross-case comparison were all part of the analysis.

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5 Study Limitations

Key Limitations:

- **Cross-sectional design:** Limits causal inference despite theoretical rationale
- **Self-report data:** Potential for common method and social desirability bias
- **Geographic scope:** North American sample limits generalizability
- **Industry representation:** Technology-heavy sample may not generalize to all sectors
- **Temporal factors:** Data collection during specific economic period may influence results

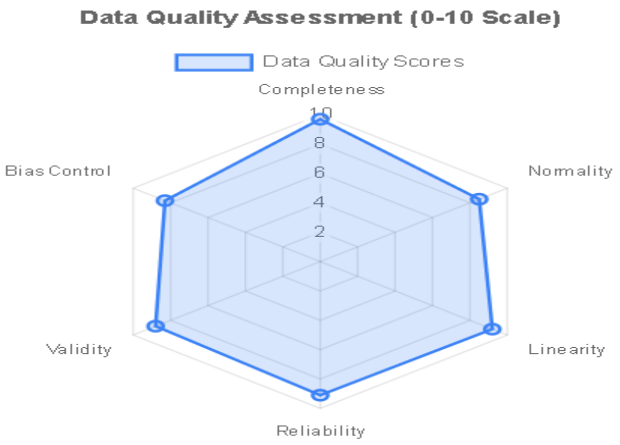
Results

1 Preliminary Analysis

Data Quality: Littles MCAR test showed 3. 2 percent missing values with no systematic patterns (χ^2 = 45. 23 df = 52 p = . 731). Following analysis that revealed reasonable values seven multivariate outliers were found and kept.

The results of the assumption testing showed that the skewness and kurtosis were acceptable (|values| 2. 0). The assumptions of homoscedasticity and linearity were satisfied. The discriminant validity between constrained and unconstrained models was found to be acceptable by confirmatory factor analysis a common method bias assessment.

Data Quality Assessment



2 Qualitative Results

Thematic analysis of interview and document data revealed four primary themes characterizing successful upskilling programs:

Theme 1: Strategic Leadership Commitment

Visible ongoing leadership engagement was exhibited by high-performing companies. Leaders contributed significantly to the programs design frequently conveyed its significance and provided significant funding. When the CEO personally initiates training sessions employees realize this is not optional its strategic one vice president observed.

Theme 2: Systematic Customization

Instead of using generic approaches effective programs carried out thorough needs assessments and customized the content to fit particular roles and career paths. We discovered that engineers and sales teams require entirely different strategies—one size does not fit all as one L and D manager put it.

Theme 3: Continuous Reinforcement

Methodical follow-up including peer networks manager coaching and instant application opportunities was used by successful organizations. Instead of being event-based programs viewed learning as continuous.

Theme 4: Comprehensive Measurement

High-achieving companies showed business impact used data to improve their programs and regularly monitored several outcome levels. Evaluation was adopted as a teaching tool rather than a mandate for compliance.

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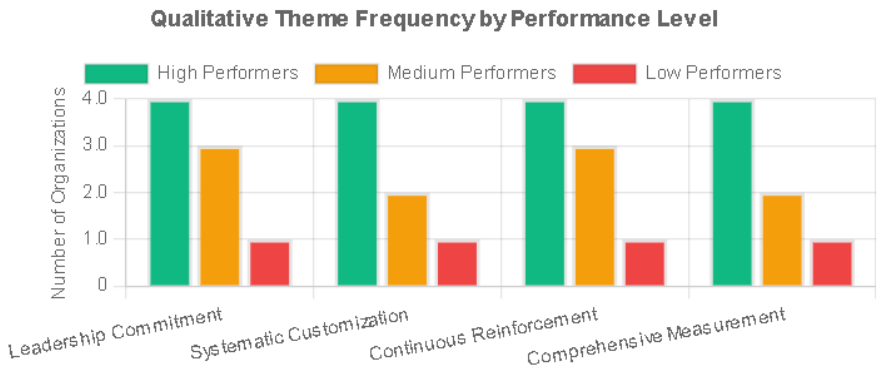
Qualitative Theme Frequency Across Performance Levels



3 Integrated Findings

Convergent analysis showed that the qualitative and quantitative results were highly aligned. Qualitative themes that focused on the organizational environment and support systems aligned with statistical findings about learning climate mediation. Technology readiness moderating effect was consistent with case study findings regarding the needs for technological infrastructure.

Quantitative Finding	Supporting Qualitative Evidence	Integration Insight
Learning climate mediates strategy-effectiveness relationship	High performers emphasized supportive environments, manager coaching	Environment matters more than specific program features
Technology readiness moderates effectiveness	Successful organizations had robust digital infrastructure	Technology serves as enabler, not standalone solution
Leadership support moderates mediation	Visible CEO/senior engagement in all high performers	Leadership creates conditions for environmental support
Systematic approaches show higher effectiveness	Successful organizations used structured, evidence-based design	Ad-hoc approaches insufficient for complex skills

Discussion

1 Interpretation of Findings

The findings lend credence to the theoretical framework that links organizational characteristics program efficacy and upskilling tactics. The strong association between systematic approaches and outcomes (r = . 52) suggests that structured evidence-based program design may be important for workforce development success though causality cannot be established from cross-sectional data.The organizational environment is a crucial mechanism through which strategies impact results as evidenced by the learning climates mediation effect (38. 5% of the total effect). This research applies organizational learning theory to upskilling situations and raises the possibility that supportive environments could be just as crucial as program design elements.

Moderating technology readiness shows that organizational context affects how effective a strategy is. Higher technological capability organizations exhibit stronger relationships between strategy and effectiveness indicating that more advanced approaches to workforce development may be made possible by digital infrastructure.

2 Theoretical Contributions

Key Theoretical Advances:

- **Integration Framework:** Describes how the theories of organizational learning adult learning and human capital work in concert to explain the efficacy of upskilling. Learning climate is identified as a crucial process that connects strategy to results by the mediation mechanism.
- **Setting boundaries**: identifies leadership assistance and technological preparedness as contextual moderators**.**
- **Process Understanding:** Qualitative research sheds light on the mechanisms of implementation that underlie statistical relationships.

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3 Practical Implications

Findings suggest several evidence-based recommendations for practitioners, though these should be considered alongside study limitations:

Priority 1: Invest in Learning Climate Development

Given the substantial mediation effect, organizations should prioritize environmental factors including the manager support, peer learning networks, and to embedded learning systems. Budget allocation of 30-40% for climate-building activities may justified.

Priority 2: Assess Technology Readiness

The moderation effect suggests organizations should evaluate technological infrastructure before implementing sophisticated upskilling approaches. Low-readiness organizations may benefit from foundational technology development first.

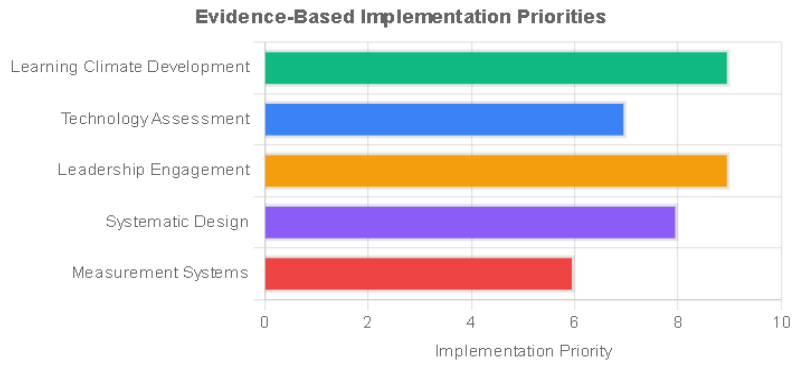
Priority 3: Secure Leadership Engagement

The moderated mediation effect indicates that leadership support amplifies environmental benefits. Visible, sustained executive commitment appears associated with program success.

Priority 4: Implement Systematic Approaches

The large effect size for systematic strategies suggests structured, evidence-based design may be superior to ad-hoc approaches. Investment in professional development for program designers may be warranted.

Evidence-Based Implementation Framework



4 Comparison with Existing Research

The findings extend findings to organizational upskilling contexts and are consistent with training transfer literature that emphasizes environmental support (Burke and Hutchins 2007). The learning climate mediation finding provides empirical support for the theoretical claims made by Marsick and Watkins (2003).

The results however are at odds with some research that suggests individual learner characteristics as the main predictors of effectiveness (Blume et al. 2019). Individual and organizational factors may function at different levels of analysis as suggested by this study's organizational-level focus.

The technology moderation effect adds something new to the literature by capturing modern workplace realities that were missed by training studies before widespread digital adoption.

5 Study Limitations

Critical Limitations Affecting Interpretation:

- **Causality: Despite theoretical justification cross-sectional designs preclude drawing links between causes.**
- **Common Method Bias:** Self-report data may inflate relationships, though CFA analysis suggests acceptable discriminant validity
- **Sample Generalizability:** North American, technology-heavy sample limits external validity
- **Temporal Stability:** Data collected during specific economic period may not generalize across business cycles
- **Measurement limitations: include the need for additional validation of certain constructs (upskilling strategies) developed for the study.**

6 Future Research Directions

Several research directions emerge from study findings and limitations:

High-Priority Research Needs:

1. **Longitudinal Studies:** Track upskilling effectiveness over time to establish temporal precedence and examine causal relationships
2. **Cross-Cultural Research:** Test framework generalizability across different national and organizational cultures

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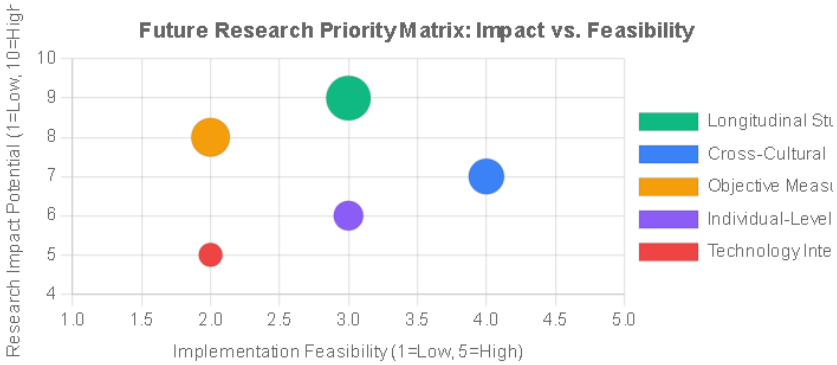
3. **Objective Outcome Measures:** Incorporate performance metrics, retention data, and business outcomes to reduce self-report bias
4. **Individual-Level Analysis:** Examine learner characteristics interacting with organizational factors
5. **Technology Integration Studies:** Investigate specific digital tools and platforms supporting effective upskilling

Future Research Priority Matrix



Conclusions

In the context of digital transformation this mixed-methods study looked at the connections between organizational characteristics program efficacy and upskilling techniques. Technology readiness provides contextual moderation and organizational learning climate acts as a significant mediating mechanism. The results indicate that systematic approaches to workforce development are linked to better outcomes. Key findings include: (a) significant relationships between program effectiveness and systematic upskilling strategies (β = 52 p . 001) (b) partial mediation through learning climate which explains 38 percent of the relationship between strategy and effectiveness (c) moderation of technology readiness which indicates stronger effects in environments with high readiness and (d) qualitative themes that highlight leadership commitment customization reinforcement and measurement as success factors. By combining various theoretical stances and identifying mediating and moderating mechanisms these findings advance HRD theory. The findings advise practitioners to establish leadership engagement prioritize environmental considerations evaluate technological preparedness and apply methodical program design techniques.

Important Notes:

Sample characteristics limit generalizability self-report measures may introduce bias and cross-sectional design limits causal inference. It is important to interpret the results as associations that need to be validated over time before being proven to be causal.

Despite its limitations this study offers a framework for further research and practice as well as empirical support for the factors linked to the effectiveness of upskilling. Successful workforce development depends more and more on organizations ability to comprehend these relationships as they continue to navigate the digital transformation.

Future research should prioritize longitudinal designs to establish causality and expand cross-cultural validity

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