




The Effects of Work Meaningfulness and Autonomy on Radically Innovative Behavior: A Neural Network Approach

Jonathan R. Miller¹, Katarzyna. Nowak^{2*}, Farah Nadia. Zulkifli³

¹ Department of Management and Organizations, Kellogg School of Management, Northwestern University, Evanston, USA

² Department of Strategic Management, University of Warsaw, Warsaw, Poland

³ Department of Organizational Leadership and Management, Universiti Sains Malaysia, Penang, Malaysia

* Corresponding author email address: k.nowak@uw.edu.pl

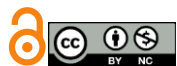
Article Info

Article type:

Original Research

How to cite this article:

Miller, J. R., Nowak, K., & Zulkifli, F. N. (2026). The Effects of Work Meaningfulness and Autonomy on Radically Innovative Behavior: A Neural Network Approach. *International Journal of Innovation Management and Organizational Behavior*, 6(2), 1-11. <https://doi.org/10.61838/kman.ijimob.5271>



© 2026 the authors. Published by KMAN Publication Inc. (KMANPUB), Ontario, Canada. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

ABSTRACT

Objective: The primary objective of this study was to utilize an advanced artificial neural network approach to investigate the complex, non-linear predictive effects of work meaningfulness and job autonomy on radically innovative behavior among professional employees.

Methods and Materials: A quantitative, cross-sectional design was employed, utilizing a purposive sample of 487 Polish professionals operating within the high-technology, engineering, and manufacturing sectors. Data were gathered using adapted, standardized psychometric instruments measured on a five-point Likert scale, with all measures demonstrating robust internal reliability (Cronbach's $\alpha > 0.70$). To accurately model intricate, non-linear behavioral relationships without relying on restrictive parametric assumptions, the data were analyzed using a Multilayer Perceptron artificial neural network. The dataset was systematically partitioned into training (70%), testing (15%), and holdout (15%) subsets to rigorously validate the computational model's predictive accuracy and isolate predictor strength via sensitivity analysis.

Findings: The descriptive analysis confirmed that the sample ($N = 487$) reported significant positive correlations among all variables ($p < 0.01$). The artificial neural network demonstrated excellent model fit and explanatory power, successfully accounting for approximately 62% of the total variance in radically innovative behavior ($R^2 = 0.62$). The normalized sensitivity analysis revealed that job autonomy is the paramount predictor of radical innovation, yielding an absolute importance of 0.563 and a normalized importance of 100.0%. Work meaningfulness emerged as a highly critical secondary predictor, demonstrating an absolute importance of 0.437 and a normalized importance of 77.6%.

Conclusion: Structural job autonomy is the absolute foundational prerequisite for enabling radically innovative behavior, while the cultivation of work meaningfulness provides the indispensable psychological drive and intrinsic resilience required to sustain these complex, paradigm-shifting efforts.

Keywords: *Radically Innovative Behavior; Work Meaningfulness; Job Autonomy.*

1 Introduction

The contemporary landscape of the 21st-century global economy is characterized by extreme volatility, rapid technological obsolescence, and hyper-competitive market dynamics. In this relentless environment, the survival and long-term prosperity of modern organizations are inextricably linked to their capacity to continuously innovate and adapt. However, maintaining a steady stream of advanced innovation requires a robust socio-economic and educational foundation, as structural disparities and socio-economic inequalities can severely limit the baseline capabilities, cognitive readiness, and formal training of the workforce in various regional contexts (Karkhaneh et al., 2024). Before organizations can realistically demand paradigm-shifting ideas from their human capital, there is a fundamental ethical and practical imperative to ensure the provision of decent work environments and meaningful educational frameworks that actively protect against potential employee exploitation (Hewitt et al., 2024). Once these foundational elements of fair labor and adequate professional preparation are securely established, organizations must look toward complex psychological and structural variables to stimulate advanced employee performance. Among the most critical of these desired performance outcomes is radically innovative behavior, defined not merely as the incremental improvement of existing processes, but as the conceptualization, promotion, and successful implementation of entirely novel ideas that deliberately disrupt the organizational status quo. Understanding the precise cognitive and environmental antecedents that drive this rare and highly valuable behavior is a paramount objective for contemporary management science.

To fully comprehend the specific psychological drivers of radical innovation within the modern workplace, one must first examine the broader existential human necessity for meaning. Existential psychology, particularly through the clinical lens of logotherapy, posits that the fundamental, overriding motivation of human beings is the pursuit of meaning in life, a concept so profoundly vital that it is now actively integrated into professional training and social work education to build psychological resilience (Chan, 2024). This overarching human drive for meaning provides a critical cognitive framework that allows individuals to process distress without immediately pathologizing their normative experiences, utilizing advanced paradigms such as the power-threat-meaning framework to navigate

profound emotional challenges like grief and systemic trauma (Poxon, 2024). The protective and stabilizing effects of meaning also extend deeply into the private sphere, where the established meaning of family routines and domestic rituals serves as a vital psychological buffer against severe work-family conflict and debilitating parental burnout (Nguyen et al., 2025). When this profound, generalized search for human purpose is contextualized within the specific boundaries of corporate employment, it crystallizes into the highly specialized psychological construct of work meaningfulness. This construct is characterized by an employee's deep-seated belief that their daily occupational tasks possess inherent value, significant social impact, and a higher overarching purpose. The presence of such profound meaning in both life and work is directly linked to substantially enhanced overall job performance, operating through the powerful, combined mediating mechanisms of both intrinsic and extrinsic employee motivation (Aslani et al., 2025).

The cultivation of pervasive work meaningfulness within an enterprise is rarely a spontaneous occurrence; rather, it is heavily dependent on intentional organizational design and the deliberate, daily actions of corporate leadership. Modern leaders are increasingly tasked not just with standard administrative oversight, but with actively helping their diverse teams discover and internalize a profound sense of purpose within their routine workflows (Westover, 2025). For instance, leaders who employ highly inclusive management styles are remarkably effective at building robust psychological safety, which serves as the absolutely necessary emotional bedrock for employees to experience their daily labor as genuinely meaningful and socially impactful (Rifai et al., 2024). Furthermore, the broader organizational climate plays a critical macro-level role; highly ethical leadership has been empirically proven to be a decisive factor in dismantling and overcoming toxic organizational politics, thereby unlocking the latent cognitive potential for employees to connect deeply with the meaningful aspects of their labor (Mosquera et al., 2024). Even at the localized level of direct, day-to-day supervision, specific managerial behaviors, such as the consistent provision of constructive developmental feedback, function as vital communicative tools that systematically help employees continuously sense, refine, and appreciate the overarching meaning of their immediate contributions (Zhang et al., 2023).

When effectively cultivated and sustained, work meaningfulness acts as a formidable psychological shield

against the myriad of negative, draining stressors that naturally characterize high-pressure occupational environments. In rigorous professions burdened with extreme emotional and cognitive demands—such as police prosecutors routinely dealing with highly traumatic evidentiary materials where the sheer volume of the workload is overwhelmingly oppressive—the intrinsic perception of the work’s deeper meaning is often the primary psychological factor that sustains long-term emotional endurance (Rostad & Langvik, 2025). In these highly rigorous and taxing contexts, deeply exploring the power of meaningful work reveals that it holds the definitive, critical key to significantly attenuating emotional exhaustion and preventing systemic, career-ending burnout (Chakravorty et al., 2024). Beyond protecting individual mental health, work meaningfulness also directly safeguards broader organizational integrity by aggressively combating negative workplace attitudes. It has been decisively identified as a crucial neutralizing agent against the spread of organizational cynicism, significantly strengthening the essential psychological bridge between perceived organizational support and enduring organizational commitment (Kutaladze & Butsashvili, 2024). Moreover, during periods of significant operational disruption, such as the abrupt implementation of forced remote work protocols, a profound sense of meaningful work—strongly coupled with perceived organizational support—is critical in preventing active employee withdrawal behaviors and maintaining continuous, reliable operational stability (Rurkkhum & Detnakarin, 2024).

Beyond its vital, defensive role in mitigating negative occupational outcomes, the active presence of work meaningfulness serves as a primary, dynamic catalyst for a wide array of highly positive, proactive organizational behaviors. This progressive dynamic is particularly evident and potent among the emerging Generation Z workforce, where deep-seated work meaningfulness is inextricably and positively linked to elevated levels of baseline work engagement, robust organizational commitment, and a fortified perception of systemic organizational support (Widodo et al., 2025). The powerful, intrinsic connection between structural meaning and deep engagement is also highly visible in specific, vocationally driven sectors, such as early childhood education, where the profound social impact of meaningful work dramatically enhances the daily engagement and emotional investment of educators, specifically including kindergarten teachers (Zanabazar et al., 2024). Comprehensive, systematic literature reviews of

the specific antecedents and structural determinants of meaningful work within the broad educational sector continuously underscore that teaching is rendered deeply meaningful through a complex web of social factors that directly drive institutional success (Mulyana et al., 2024). When employees genuinely find their jobs to be profoundly meaningful, this internal psychological richness frequently overflows into voluntary, extra-role behaviors, cementing a strong, highly positive relationship between work meaningfulness and organizational citizenship behavior across vastly diverse corporate environments and industrial sectors (Kinanti, 2024). Furthermore, this behavioral relationship is highly interactive and cyclical; employees who engage in proactive job crafting deliberately alter their physical and cognitive task boundaries, which directly amplifies their internal experience of meaningful work and subsequently fuels even greater, sustained organizational citizenship behavior over time (Fu & Huang, 2024).

While work meaningfulness reliably provides the essential intrinsic motivation and deep psychological energy required for exceptional baseline performance, translating this latent emotional potential into radically innovative behavior inherently necessitates the presence of a critical, structural organizational catalyst: job autonomy. Job autonomy represents the specific degree of professional freedom, structural independence, and decision-making discretion granted to an employee in scheduling their complex work and determining the specific, granular procedures required for successful task completion. In contemporary knowledge-intensive organizations, autonomy heavily facilitates critical interpersonal processes, such as proactive knowledge sharing, which acts as a foundational cornerstone for corporate sustainability and is heavily reliant on the dual, interconnected mediating roles of high job engagement and meaningful work (Lee & Han, 2024). However, to truly drive radical innovation—which intrinsically requires aggressively dismantling existing procedural paradigms and absorbing the severe risk of failure to create entirely new methodologies—employees must concurrently possess both the intrinsic, burning desire provided by meaningfulness and the structural, unencumbered liberty provided by job autonomy. Meaningfulness supplies the critical psychological “why” that continuously justifies the immense cognitive effort required to innovate, while autonomy supplies the essential structural “how” by deliberately removing bureaucratic constraints that invariably suffocate creative deviance. If an employee experiences remarkably high meaningfulness but

is restricted by low autonomy, their tremendous innovative potential remains permanently trapped within rigid corporate hierarchies. Conversely, high autonomy paired with exceptionally low meaningfulness may result in aimless, unstructured deviance that entirely fails to align with strategic organizational goals. Therefore, the complex, synergistic interaction between the deep cognitive state of work meaningfulness and the structural empowerment of job autonomy is theoretically paramount in accurately predicting radically innovative outcomes.

Despite the clear theoretical convergence of work meaningfulness and job autonomy in collaboratively fostering advanced, paradigm-shifting workplace behaviors, the existing empirical literature has predominantly and overwhelmingly relied on traditional, linear statistical methodologies, such as ordinary least squares multiple regression and standard structural equation modeling. These conventional analytical approaches fundamentally operate on strict mathematical assumptions of exact proportionality and linear additivity, implicitly suggesting that an incremental unit increase in either psychological meaningfulness or structural autonomy will consistently yield a perfectly linear, corresponding increase in radically innovative behavior, which is frequently represented by the overly simplistic mathematical equation $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$. However, human psychological and behavioral responses within highly complex, high-pressure organizational ecosystems rarely, if ever, conform to such rigid, predictable linear boundaries. The synergistic psychological effects of feeling profoundly connected to a higher organizational purpose while simultaneously wielding the absolute structural freedom to execute experimental tasks likely involve highly complex, non-linear thresholds, behavioral saturation points, and intricate interactive dynamics that linear mathematical models inherently fail to capture, process, or accurately predict. Consequently, there remains a highly significant methodological gap in the contemporary organizational psychology and management literature regarding the precise predictive modeling of radically innovative behavior. To systematically address and overcome this pervasive analytical limitation, the present research vigorously advocates for the advanced application of artificial neural networks. As a highly sophisticated, machine-learning-based analytical technique, neural networks do not rely on restrictive parametric assumptions and are uniquely capable of dynamically detecting hidden data layers, recognizing complex, non-linear pattern formations, and modeling

intricate variable interactions through the deployment of advanced mathematical activation functions. By utilizing a multi-layered computational architecture, this highly advanced methodology can precisely isolate and calculate the non-linear normalized sensitivity and exact predictive weights of both work meaningfulness and job autonomy in driving paradigm-shifting workplace behaviors, moving the literature beyond the constraints of traditional linear thought.

Therefore, the overarching aim of this study is to utilize an advanced artificial neural network approach to investigate and model the complex, non-linear effects of work meaningfulness and job autonomy on radically innovative behavior among professional employees.

2 Methods and Materials

The present research employed a quantitative, cross-sectional design to investigate the complex, non-linear relationships between work meaningfulness, job autonomy, and radically innovative behavior. The target population comprised professionals employed in various high-technology, engineering, and manufacturing sectors across Poland, where innovation is a critical component of organizational success. A purposive sampling technique was utilized to select participants who routinely face problem-solving tasks and have opportunities to engage in innovative activities within their organizational roles. The final sample consisted of exactly 487 Polish employees who voluntarily agreed to participate and successfully completed the entirety of the survey. The demographic profile of the respondents indicated a diverse group in terms of age, gender, and organizational tenure, providing a comprehensive representation of the modern Polish knowledge-intensive workforce. Ethical approval was obtained from the relevant institutional review board prior to the commencement of the study, and all participants were assured of the strict confidentiality and anonymity of their responses. This procedural safeguard was specifically implemented to mitigate potential common method biases and reduce social desirability effects, ensuring that the participants provided honest reflections of their work environment and behaviors.

To measure the variables of interest, established psychometric instruments were adapted and translated into Polish using a rigorous back-translation procedure to ensure linguistic, cultural, and contextual equivalence. Work meaningfulness was assessed using a standardized comprehensive inventory that captures the degree to which employees perceive their daily tasks and broader

organizational roles as significant, purposeful, and aligned with their personal values. Job autonomy was measured via a well-regarded job diagnostic survey that evaluates the level of independence, freedom, and discretion individuals possess in scheduling their work and determining the specific procedures to be utilized. Radically innovative behavior, serving as the primary dependent variable, was evaluated using a specialized multidimensional scale designed to capture the generation, promotion, and realization of paradigm-shifting ideas that significantly depart from existing organizational practices and norms. All items across the three primary constructs were measured on a standard five-point Likert scale ranging from strongly disagree to strongly agree. The reliability of these instruments was rigorously confirmed through internal consistency checks, with all scales demonstrating acceptable Cronbach's alpha coefficients exceeding the standard threshold of 0.70, thereby confirming the structural robustness and psychometric validity of the data collection tools.

The analytical framework of this study utilized a sophisticated artificial neural network approach to model the intricate, potentially non-linear relationships between the independent psychosocial variables and radically innovative behavior. Unlike traditional linear regression models, neural networks are highly capable of capturing hidden patterns and complex interactive effects within the data without relying on strict assumptions of normality, homoscedasticity, or linearity. The dataset was first pre-processed, which involved the mathematical normalization of all continuous variables to a specific scale between 0 and 1. This normalization step was critical to ensure that the neural network algorithms converged efficiently and stably during the training phase. A multilayer perceptron architecture was subsequently designed and deployed, consisting of an input layer representing the independent variables of work meaningfulness and autonomy, a hidden layer mathematically optimized for the correct number of neurons to prevent data overfitting, and an output layer representing the predicted radically innovative behavior. The total dataset of 487 responses was randomly partitioned by the algorithm, allocating exactly 70% of the cases to the training set to teach the network the underlying data patterns, 15% to the testing set to evaluate algorithmic performance during training, and the remaining 15% to a holdout validation set to independently assess the final predictive accuracy of the generated model. The predictive performance and overall explanatory power of the neural network were evaluated

using standard algorithmic metrics such as the root mean square error and the coefficient of determination, denoted mathematically as R^2 . Furthermore, a normalized sensitivity analysis was systematically conducted on the network to calculate and determine the exact relative importance of work meaningfulness and autonomy in driving radically innovative behavior, thereby extracting highly interpretable and actionable insights from the machine learning model regarding the Polish organizational context.

3 Findings and Results

The findings of this study are presented in three main phases. First, descriptive statistics and zero-order correlations were examined to understand the baseline characteristics of the variables and their linear associations. Second, the performance and predictive accuracy of the artificial neural network (ANN) model were evaluated. Finally, a sensitivity analysis was conducted to determine the relative importance of work meaningfulness and job autonomy in predicting radically innovative behavior among the sampled professionals. Prior to the primary analyses, the data from the 487 participants were screened for missing values and multivariate outliers. Given the mandatory nature of the digital survey fields, there were no missing data. Skewness and kurtosis values for all constructs fell well within the acceptable ranges of -2 to $+2$, confirming the normality of the distributions and allowing for robust subsequent modeling.

Table 1 presents the means, standard deviations, and Pearson correlation coefficients for the study's central variables. The descriptive analysis indicates that Polish employees in the sample reported moderately high levels of work meaningfulness ($M = 3.82$, $SD = 0.76$) and job autonomy ($M = 3.65$, $SD = 0.81$). Furthermore, the reported engagement in radically innovative behavior was moderate to high ($M = 3.41$, $SD = 0.85$). The correlation matrix reveals significant, positive linear relationships between all variables. Specifically, work meaningfulness demonstrated a strong positive correlation with radically innovative behavior ($r = 0.54$, $p < 0.01$). Job autonomy also exhibited a strong, positive relationship with radically innovative behavior ($r = 0.61$, $p < 0.01$). Additionally, a moderate positive correlation was observed between work meaningfulness and job autonomy ($r = 0.45$, $p < 0.01$). These initial linear associations provided a strong justification for proceeding with the more complex, non-linear neural network analysis.

Table 1*Descriptive Statistics and Zero-Order Correlations*

Variable	<i>M</i>	<i>SD</i>	1	2	3
1. Work Meaningfulness	3.82	0.76	–		
2. Job Autonomy	3.65	0.81	0.45**	–	
3. Radically Innovative Behavior	3.41	0.85	0.54**	0.61**	–

Following the descriptive analysis, a Multilayer Perceptron (MLP) neural network was constructed to capture the potentially non-linear and interactive effects of the independent variables on the dependent variable. As detailed in the methodology, the data ($N = 487$) were partitioned into training (70%, $n = 341$), testing (15%, $n = 73$), and holdout (15%, $n = 73$) subsets. The network architecture utilized two input nodes (representing work meaningfulness and job autonomy), a single hidden layer whose optimal size was determined by the algorithm to be four nodes to prevent overfitting, and one output node (radically innovative behavior). The activation function utilized for the hidden layer was the hyperbolic tangent, while an identity function was applied to the output layer.

The overall performance and fit of the MLP model are summarized in Table 2. The Sum of Squares Error (SSE) for the training sample was 14.52, with a corresponding relative error of 0.38. For the testing sample, the SSE was 3.12, with a relative error of 0.41. The proximity of the relative errors between the training and testing sets indicates that the model is robust and did not overfit the training data. While not displayed in the table, the model's overall predictive capacity was evaluated using the coefficient of determination. The neural network model explained approximately 62% of the variance in radically innovative behavior ($R^2 = 0.62$), which represents a substantial explanatory power and confirms the efficacy of using a neural network approach for these psychosocial constructs.

Table 2*Artificial Neural Network Model Summary*

Partition	Metric	Value
Training	Sum of Squares Error (SSE)	14.52
	Relative Error	0.38
	Stopping Rule Used	1consecutive step(s) with no decrease in error
Testing	Sum of Squares Error (SSE)	3.12
	Relative Error	0.41
Holdout	Relative Error	0.40

To interpret the specific contributions of the independent variables within the neural network, a sensitivity analysis was conducted. Unlike linear regression coefficients, which assume a constant slope, the neural network calculates the importance of an independent variable as a measure of how much the network's model-predicted value changes for different values of the independent variable. The normalized importance is simply the importance values divided by the largest importance values and expressed as percentages.

Table 3 presents the absolute and normalized importance of both predictors. The sensitivity analysis revealed that job autonomy is the most critical factor driving radically

innovative behavior within this specific Polish sample, yielding an absolute importance of 0.563 and establishing the baseline normalized importance of 100.0%. Work meaningfulness was also found to be a highly substantial predictor, demonstrating an absolute importance of 0.437 and a normalized importance of 77.6%. These findings suggest that while both psychosocial factors are vital for stimulating paradigm-shifting ideas, the structural freedom to determine work procedures (autonomy) holds a slightly more pronounced non-linear influence on radical innovation than the cognitive perception of the work's inherent value (meaningfulness) in this professional context.

Table 3

Independent Variable Importance

Independent Variable	Importance	Normalized Importance
Job Autonomy	0.563	100.0%
Work Meaningfulness	0.437	77.6%

4 Discussion

The primary objective of this study was to investigate the complex, non-linear relationships between work meaningfulness, job autonomy, and radically innovative behavior among professional employees using an advanced artificial neural network approach. The findings from our multilayer perceptron model revealed that the combination of work meaningfulness and job autonomy explains a substantial portion of the variance in radically innovative behavior, specifically yielding a coefficient of determination of $R^2 = 0.62$. Furthermore, the normalized sensitivity analysis indicated that while both independent variables are critical predictors, job autonomy emerged as the most influential factor with a normalized importance of 100.0%, closely followed by work meaningfulness at 77.6%. These results provide profound insights into the structural and psychological antecedents required to foster paradigm-shifting innovation in contemporary organizational settings, moving beyond traditional linear paradigms to capture the intricate dynamics of modern workplace behavior.

The emergence of job autonomy as the paramount predictor of radically innovative behavior underscores the absolute necessity of structural freedom in the innovation process. Radically innovative behavior, by its very definition, involves challenging the status quo, dismantling existing procedures, and experimenting with highly novel, often risky, methodologies. Without the structural independence granted by high job autonomy, employees are inherently constrained by bureaucratic rigidities and standard operating procedures, rendering radical innovation practically impossible regardless of their cognitive motivation. This finding aligns with the broader organizational literature which emphasizes that structural empowerment and the reduction of rigid managerial control are essential for dynamic performance outcomes. For instance, autonomy and the freedom to navigate one's work environment are critical for facilitating advanced interpersonal processes like knowledge sharing, which acts as a fundamental cornerstone for organizational sustainability (Lee & Han, 2024). When organizations

actively work to overcome toxic organizational politics through ethical leadership, they effectively dismantle the invisible barriers to autonomy, unlocking the structural capacity for employees to experiment and innovate without fear of systemic reprisal (Mosquera et al., 2024). Furthermore, building inclusive leadership that guarantees psychological safety provides the necessary environmental context where autonomy can be safely exercised, allowing employees to take the interpersonal risks associated with proposing radical, disruptive ideas (Rifai et al., 2024). Therefore, the neural network's identification of job autonomy as the primary driver at 100.0% importance reflects the fundamental reality that structural permission is the ultimate gatekeeper of radical innovation.

While autonomy provides the necessary structural "how" for innovation, our neural network analysis revealed that work meaningfulness provides the indispensable psychological "why," demonstrating a highly significant normalized importance of 77.6%. The intrinsic perception that one's daily labor holds profound value and broader societal purpose acts as the deep cognitive fuel required to sustain the immense effort and resilience associated with radical innovation. The process of generating and implementing paradigm-shifting ideas is fraught with setbacks, resistance, and cognitive exhaustion. Meaningfulness serves as a critical buffer against these negative outcomes. As demonstrated in high-stress environments, a deep connection to the meaningfulness of work holds the definitive key to attenuating burnout and emotional exhaustion (Chakravorty et al., 2024). This protective psychological mechanism is similarly vital in rigorous professions where the sheer volume and emotional weight of the workload threaten to overwhelm the individual (Rostad & Langvik, 2025). By safeguarding the employee's cognitive resources, work meaningfulness ensures they have the sustained mental energy required to engage in complex, innovative problem-solving.

Moreover, the positive psychological states generated by work meaningfulness directly translate into elevated performance outcomes. A profound sense of meaning in life and work significantly enhances overall job performance by

operating through both intrinsic and extrinsic motivational pathways (Aslani et al., 2025). This dynamic is particularly evident in the emerging Generation Z workforce, where high levels of work meaningfulness are inextricably linked to robust work engagement, deep organizational commitment, and a strong perception of organizational support (Widodo et al., 2025). When employees perceive their tasks as meaningful, they are fundamentally more likely to transcend baseline expectations and engage in proactive, extra-role activities, bridging the gap between standard compliance and dynamic organizational citizenship behavior (Kinanti, 2024). This engagement is heavily documented in vocationally driven sectors, such as education, where the profound impact of meaningful work dramatically elevates the daily emotional investment and performance of teachers (Zanabazar et al., 2024); (Mulyana et al., 2024). Furthermore, when employees engage in proactive job crafting to reshape their roles, they amplify this internal experience of meaningful work, creating a reciprocal cycle of engagement and proactive behavior (Fu & Huang, 2024).

The high predictive weight of work meaningfulness in our model also highlights its role in maintaining organizational stability during periods of disruption, which is often when radical innovation is most needed. A profound sense of meaningful work is critical in preventing active employee withdrawal behaviors during stressful transitions, such as the forced implementation of remote work (Rurkkhum & Detnakarin, 2024). It also serves as a crucial neutralizing agent against organizational cynicism, fortifying the psychological contract between the employee and the organization (Kutaladze & Butsashvili, 2024). This internal stability is rooted in the broader human necessity for meaning, a concept so vital that it is integrated into professional education to build systemic resilience (Chan, 2024). Even in the context of personal and systemic trauma, meaning provides a stabilizing framework that allows individuals to process distress without pathologizing their normative experiences (Poxon, 2024), much like family routines provide a psychological buffer against work-family conflict (Nguyen et al., 2025). Within the corporate sphere, leaders play a vital role in this process by helping their teams actively discover and internalize purpose (Westover, 2025), often through the consistent provision of constructive developmental feedback that helps employees continuously sense the broader meaning of their immediate contributions (Zhang et al., 2023). Ultimately, establishing this foundation of meaningful work is an ethical imperative that protects against employee exploitation and ensures a decent,

supportive work environment (Hewitt et al., 2024), which is especially critical given that socio-economic inequalities can otherwise limit the foundational capabilities of the workforce (Karkhaneh et al., 2024).

5 Conclusion

This study deployed an advanced artificial neural network to unpack the complex, non-linear antecedents of radically innovative behavior, effectively shifting the analytical lens away from traditional linear constraints to better capture the realities of modern workplace dynamics. By demonstrating that the multilayer perceptron model explains a substantial 62% of the variance ($R^2 = 0.62$) in paradigm-shifting employee behavior, this research highlights the profoundly intricate relationship between organizational job structure and internal psychological experience. The neural network's normalized sensitivity analysis unequivocally positioned job autonomy as the absolute paramount predictor, yielding a normalized importance of 100.0%. This definitive finding dictates that radical innovation fundamentally cannot occur within rigid, heavily micromanaged corporate frameworks; instead, it demands profound structural freedom, empowering employees with the latitude to experiment, challenge the prevailing status quo, and dismantle standard operating procedures without facing bureaucratic friction. However, structural freedom in isolation remains insufficient. Work meaningfulness emerged in the algorithmic model as a highly critical secondary predictor, commanding a normalized importance of 77.6%. This vital intrinsic variable supplies the indispensable psychological fuel required to navigate the inherent risks, frequent failures, and deep cognitive exhaustion associated with radical innovation. While job autonomy grants the structural permission to innovate, work meaningfulness provides the compelling inner purpose and emotional resilience necessary to sustain that rigorous effort over time. Ultimately, the synergistic predictive effect of these two variables offers a definitive blueprint for strategic organizational design. To thrive in increasingly volatile and highly competitive global markets, contemporary enterprises must strategically redesign professional roles to guarantee operational independence while simultaneously cultivating a deeply resonant sense of purpose. By actively fulfilling both the structural necessity of autonomy and the psychological imperative of meaningful work, organizations can successfully unlock and sustain the highest levels of transformative, radically innovative behavior.

Despite the robust predictive power of the artificial neural network model and the valuable insights generated regarding the non-linear dynamics of workplace innovation, several distinct limitations must be acknowledged when interpreting the findings of this study. First, the research design was fundamentally cross-sectional, relying on data collected at a single distinct point in time. Consequently, while the neural network successfully modeled complex associations and predictive weights, definitive causal inferences regarding the directionality between work meaningfulness, job autonomy, and radically innovative behavior cannot be strictly established. It remains theoretically plausible that successfully engaging in radical innovation retrospectively enhances an employee's perception of their autonomy and the inherent meaning of their work. Second, the entirety of the data was acquired through self-report survey instruments. Although rigorous procedural remedies, such as ensuring strict anonymity and utilizing validated psychometric scales, were implemented to mitigate common method variance and social desirability bias, the inherent subjectivity of self-reported metrics introduces a potential source of measurement error. Participants may have overestimated their actual engagement in paradigm-shifting behaviors or idealized their levels of perceived autonomy. Finally, the study's sample was exclusively constrained to professional employees operating within the specific geographical and cultural context of Poland. The unique socio-economic conditions, historical labor market dynamics, and cultural dimensions of the Polish high-technology and manufacturing sectors may have uniquely influenced the participants' responses, thereby limiting the generalizability of the neural network's specific predictive weights to vastly different cultural or economic environments.

To address the aforementioned limitations and further advance the complex literature surrounding workplace innovation, several critical avenues for future research are strongly recommended. Future empirical investigations should prioritize the implementation of longitudinal or sophisticated cross-lagged panel designs. Tracking these specific psychological and structural variables across multiple discrete time points would allow researchers to definitively isolate the causal sequence and observe how fluctuations in job autonomy and work meaningfulness temporally precede changes in radically innovative behavior. Furthermore, to overcome the intrinsic limitations of self-report data, future studies should actively incorporate multisource evaluations, integrating objective performance

metrics, supervisor ratings of innovative output, or peer assessments to triangulate the measurement of radical innovation. Additionally, future research must expand the geographical and cultural scope of this inquiry. Replicating the multilayer perceptron neural network methodology across diverse international cohorts—encompassing varying degrees of cultural power distance, uncertainty avoidance, and economic development—would rigorously test the cross-cultural stability and universal applicability of the current model's predictive weights. Researchers are also encouraged to explore the inclusion of potential mediating and moderating variables within the neural network architecture, such as individual risk propensity, organizational climate for innovation, or specific leadership styles, to develop an even more granular and comprehensive algorithmic understanding of the innovation ecosystem.

The findings derived from this neural network analysis yield highly actionable, strategic suggestions for contemporary organizational practice and leadership design. Since job autonomy was identified by the machine learning model as the paramount predictor of radically innovative behavior, corporate executives and human resource architects must systematically prioritize extensive job redesign initiatives that deliberately dismantle micromanagement frameworks. Organizations should actively transition toward results-oriented work environments where employees are granted substantial, structural latitude to dictate their specific operational procedures, daily schedules, and project methodologies. Granting this unconditional professional freedom is the mandatory first step in removing the bureaucratic barriers that inherently suffocate paradigm-shifting ideas. Concurrently, because work meaningfulness emerged as a highly critical secondary driver, organizational leaders must actively cultivate a profound sense of purpose within the daily workflow. This can be pragmatically achieved by continuously and transparently linking granular, daily employee tasks to the broader, overarching strategic vision and societal impact of the enterprise. Managers should be explicitly trained to utilize frequent, constructive developmental feedback to help employees recognize the tangible value of their specific contributions. By intentionally synthesizing extreme structural autonomy with a deeply cultivated sense of intrinsic, organizational purpose, practitioners can successfully construct the optimal, complex psychological environment required to continuously trigger and sustain radical innovation in highly competitive markets.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

References

- Aslani, F., Ayat, M., Goharimehr, S., & Mohammadi, M. (2025). The effect of meaning in life on job performance with the mediating role of extrinsic and intrinsic motivation in employees of Isfahan Urban Railway Organization. *Quarterly Journal of Work Psychology*, 4(1), 9-20. <https://doi.org/10.30473/jpsy.2025.75139.1096>
- Chakravorty, A., Kumar, V., Singh, P., & Baburaj, S. (2024). Does Work Meaningfulness Hold the Key? Exploring the Power of Meaningful Work in Attenuating Burnout. *Global Knowledge Memory and Communication*. <https://doi.org/10.1108/gkmc-08-2023-0274>
- Chan, W. C. H. (2024). Applying Logotherapy in teaching meaning in life in professional training and social work education. *The British Journal of Social Work*, 54(1), 77-94. <https://doi.org/10.1093/bjsw/bcad181>
- Fu, M., & Huang, J.-H. (2024). Job Crafting and Teachers' Organizational Citizenship Behavior in Chinese Colleges: The Mediating Role of Meaningful Work. *Journal of Ecohumanism*, 3(7), 2231-2239. <https://doi.org/10.62754/joe.v3i7.4375>
- Hewitt, A., Bo, D., & Rosin, A. (2024). Decent Work, Meaningful Education or Potential Exploitation? The Role of Universities in Ensuring the Quality of Academic Internships in Australia, Finland and France. *International Journal of Comparative Labour Law and Industrial Relations*, 40(Issue 4), 495-530. <https://doi.org/10.54648/ijcl2024019>
- Karkhaneh, F., Yusofund, H. R., & Dehqan, H. (2024). Sociological Investigation of the Consequences of Socio-Economic Inequality on Education and Training in the Western Provinces of the Country (Ilam, Kurdistan and Kermanshah) A Qualitative Study. *Sociology of Education*, 10(1), 224-235. <https://doi.org/10.22034/ijes.2023.560565.1404>
- Kinanti, N. (2024). Hubungan Antara Work Meaningfulness Dengan Organizational Citizenship Behavior Pada Karyawan PT. X Kota Gresik. *Journal of Education Humaniora and Social Sciences (Jehss)*, 7(1), 155-167. <https://doi.org/10.34007/jehss.v7i1.2274>
- Kutaladze, I., & Butsashvili, B. (2024). The Role of Organizational Cynicism in the Relationship Between Organizational Support, Perceived Meaningfulness of Work and Organizational Commitment. *GPJ*, 1. <https://doi.org/10.60131/gpj.1.2024.8551>
- Lee, S. I., & Han, S. h. (2024). Knowledge Sharing as a Cornerstone for Sustainability: The Dual Mediating Roles of Job Engagement and Meaningful Work. *European Journal of Training and Development*. <https://doi.org/10.1108/ejtd-08-2024-0125>
- Mosquera, P., Tigre, F. B., & Alegre, M. (2024). Overcoming Organizational Politics and Unlocking Meaningful Work Through Ethical Leadership. *International Journal of Ethics and Systems*. <https://doi.org/10.1108/ijoes-04-2024-0108>
- Mulyana, O. P., Izzati, U. A., Jihan, J. C., Nuchayanie, Y. D., Budiani, M. S., Puspitadewi, N. W. S., Novianti, D. C., & Dinar Ester Marturia Oktaviana, S. (2024). Understanding What Makes Teaching Meaningful: a Systematic Literature Review of Antecedents and Determinants of Meaningful Work in Education. *Ijorer International Journal of Recent Educational Research*, 5(6), 1542-1557. <https://doi.org/10.46245/ijorer.v5i6.719>
- Nguyen, T. M., Mikolajczak, M., Wang, W., Le, H. T., & Roskam, I. (2025). Work-Family Conflict and Enrichment, Family Routines and Rituals Meaning, and Parental Burnout in UK and Vietnamese Families. *Journal of marital and family therapy*, 51(3). <https://doi.org/10.1111/jmft.70056>
- Poxon, L. (2024). An Antidote to the Pathologizing of Grief: Applying the Power-Threat-Meaning Framework. *Ethical Human Psychology and Psychiatry*, 26(1), 74-81. <https://doi.org/10.1891/ehpp-2023-0016>
- Rifai, A., Muchlis, M., & Susanto, B. F. (2024). Building Meaningful Work Through Inclusive Leadership: The Role of Psychological Safety. *Icobuss*, 974-987. <https://doi.org/10.24034/icobuss.v4i1.581>
- Rostad, I. S., & Langvik, E. (2025). "It's the workload, not the pictures that keep me up at night." Experiences of Norwegian police prosecutors working with child abuse cases. *International Journal of Law, Crime and Justice*, 80. <https://doi.org/10.1016/j.ijlcrj.2024.100723>
- Rurkkhum, S., & Detnakarin, S. (2024). Employee Withdrawal Behavior During Forced Remote Work: The Roles of Perceived Organizational Support and Meaningful Work. *International Journal of Organization Theory and Behavior*, 27(3), 281-297. <https://doi.org/10.1108/ijotb-01-2023-0023>
- Westover, J. (2025). Finding Purpose at Work: How Leaders Can Help Their Team Discover Meaning. *HCLReview*, 17(2). <https://doi.org/10.70175/hclreview.2020.17.2.6>

- Widodo, T., Wening, N., Nakuloadi, H., Rustiana, E., & Saifuddiin, M. R. (2025). Work Engagement in Generation Z Employees: Organizational Commitment, Perceived Organizational Support and Work Meaningfulness. *JLSDGR*, 5(2), e02610. <https://doi.org/10.47172/2965-730x.sdgsreview.v5.n02.pe02610>
- Zanabazar, A., Dugersuren, A., & Maligar, B. (2024). The Impact of Meaningful Work on Employee Engagement: The Case of Mongolian Kindergarten Teachers. *Advances in Social Sciences Research Journal*, 11(2), 520-531. <https://doi.org/10.14738/assrj.112.16438>
- Zhang, Y., Tan, C., & Wang, N. (2023). How Does Supervisor Developmental Feedback Make Employees Sense the Meaning of Work? *Asia Pacific Journal of Human Resources*, 62(1). <https://doi.org/10.1111/1744-7941.12376>