

Using Random Forests to Predict Team Creativity from Psychological Diversity and Emotional Intelligence

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ABSTRACT

Objective: The objective of this study was to deploy a Random Forest machine learning algorithm to evaluate the predictive power and complex non-linear interactions of psychological diversity and team emotional intelligence on collective team creativity.

Methods and Materials: A cross-sectional quantitative research design was employed, collecting data from 412 employees nested within 65 established work teams in the Greek corporate sector. Team creativity was assessed via supervisor ratings, while emotional intelligence and psychological diversity (measured as the standard deviation of Big Five personality traits within teams) were self-reported and statistically aggregated to the team level. Data analysis utilized Random Forest regression, comparing its predictive performance against traditional Multiple Linear Regression using an 80% training set (52 teams) and a 20% testing set (13 teams), with hyperparameters optimized via grid search cross-validation.

Findings: The Random Forest model significantly outperformed Multiple Linear Regression in predicting team creativity on the testing set ($R^2 = 0.68$, $RMSE = 0.34$, $MAE = 0.27$ versus $R^2 = 0.45$, $RMSE = 0.51$, $MAE = 0.42$). Variable importance analysis revealed that Team Emotional Intelligence was the paramount predictor (Importance Score = 0.345, $r = 0.54$, $p < .01$). This was followed by psychological diversity in Openness (Importance Score = 0.212, $r = 0.41$, $p < .01$) and Extraversion (Importance Score = 0.158, $r = 0.35$, $p < .05$), which both positively correlated with creative output. Conversely, diversity in Conscientiousness (Importance Score = 0.115, $r = -0.28$, $p < .05$) demonstrated a negative impact on team creativity.

Conclusion: High aggregate emotional intelligence and specific deep-level personality diversities interact in highly non-linear patterns to drive team innovation, underscoring the necessity of advanced ensemble learning techniques for accurate organizational and behavioral modeling.

Keywords: Team Creativity, Emotional Intelligence, Psychological Diversity, Machine Learning, Personality Psychology

1 Introduction

In the contemporary global economy, organizations are increasingly dependent on the innovative capacities of their workforce to maintain competitive advantage, adapt to rapid technological shifts, and ensure long-term sustainability. The foundation of organizational success is no longer solely rooted in rigid operational efficiency, but rather in the continuous generation, promotion, and implementation of novel ideas. Consequently, cultivating an environment that actively stimulates employee innovation behavior has become a paramount objective for strategic human resource management (Shaalan et al., 2022). Effective human resource systems, particularly high-commitment models, have been shown to significantly enhance employees' willingness to engage in innovative practices by fostering a strong sense of organizational belonging and promoting a deeper acceptance of organizational change (You & Park, 2024). The evolution of these human resource systems into the digital realm further accelerates this dynamic. Digital human resource management practices not only streamline administrative processes but also act as potent catalysts for employee innovation behavior, a relationship heavily mediated by the organization's overarching capacity for continuous organizational learning (Alrifae, 2025). Furthermore, the overarching employment models and contractual structures adopted by firms dictate the psychological contracts formed with their employees, directly influencing their creative output and baseline willingness to engage in discretionary, innovative tasks beyond standard job requirements (Xie & Fang, 2020). Establishing strong organizational competence and securing deep-rooted commitment from employees are indispensable prerequisites for translating human capital into measurable performance outcomes, with innovation behavior serving as a critical intervening variable in this complex human-centric relationship (Mertiningsih et al., 2024).

The realization of a highly innovative workforce is intricately linked to the quality and specific style of leadership operating within the organization. Leaders act as the primary conduit through which organizational culture and values are transmitted, significantly shaping the psychological landscape and behavioral boundaries of their subordinates. Transformational leadership, for instance, has been consistently linked to enhanced service innovation behavior by directly elevating employees' psychological capital, thereby imbuing them with the essential resilience,

self-efficacy, and optimism necessary to persist in the pursuit of novel solutions (Markus et al., 2018). This positive effect is particularly pronounced when there is a strong cognitive alignment and like-mindedness between senior leaders, such as Chief Executive Officers, and their creative personnel, which fosters a cooperative atmosphere highly conducive to intellectual risk-taking and divergent thinking (Liu & Niu, 2020). Authentic leadership also plays a vital role, especially in specialized, fined, peculiar, and innovative small to medium enterprises, where genuine and transparent leader-follower interactions directly boost work engagement and subsequent innovation behaviors (Zhang et al., 2023).

Moreover, the ethical dimensions of leadership cannot be overlooked in the pursuit of creativity. Ethical leaders cultivate a climate of profound trust and psychological safety, which has been proven to significantly boost specialized forms of creativity, such as employee green innovation behavior, acting through complex mediating mechanisms that align individual moral values with broader organizational sustainability goals (Yang & Liu, 2022). Similarly, environmental leadership specifically targets the promotion of green behaviors, utilizing moderated mediation pathways to encourage employees to continuously develop eco-friendly technological innovations in sectors with heavy ecological footprints (Xu et al., 2022). Beyond these paradigms, entrepreneurial leadership has been identified as a critical driver in high-stakes environments, such as healthcare, where leaders who actively encourage opportunity recognition significantly impact the innovation behavior of critical frontline staff, including nurses (Bagheri & Akbari, 2018). The underlying quality of the relationship between leaders and members, widely conceptualized as leader-member exchange, is another critical determinant of creative output. High-quality exchanges provide employees, such as university lecturers, with the necessary informational resources, autonomy, and psychological backing to engage in proactive innovation (Zhu & Tsai, 2024). Additionally, shared leadership structures, where decision-making power is horizontally distributed among team members rather than centralized, have been shown to complexly interact with unconventional or deviant innovation behaviors, highlighting the highly nuanced role of power dynamics in the creative process (Chen & Ma, 2025). Furthermore, comprehensive leadership development programs explicitly designed to foster both explorative and exploitative behaviors in management teams are essential for driving organizational-wide learning and

sustaining continuous innovation over time (Kjellström et al., 2022).

While strategic leadership and human resource frameworks provide the vital contextual scaffolding for innovation, the fundamental driver of creative output remains the individual's psychological makeup and deeply ingrained cognitive orientation. From the perspective of personality psychology, the dynamic interplay between an individual's intrinsic personality traits and their immediate working environment profoundly dictates their capacity for innovative behavior, a phenomenon particularly evident in high-pressure, high-ambiguity settings like new corporate ventures (Yang & Wu, 2021). Intrinsic motivation acts as the ultimate internal engine for creativity; when knowledge-based employees in the new industrial generation are internally driven by the work itself, they are significantly more likely to engage in robust knowledge sharing and sustained, high-level innovation behavior (Yu, 2021). This intrinsic motivation is deeply intertwined with an individual's specific goal orientation. Employees possessing a strong learning goal orientation are inherently more disposed to enthusiastically engage in complex problem-solving and proactive innovation behaviors, a psychological dynamic extensively validated across diverse cultural datasets (Mei-rong et al., 2022). The Theory of Planned Behavior further elucidates this by demonstrating how internal attitudes, perceptions of subjective norms, and perceived behavioral control collectively and accurately forecast the initiative-taking scientific research and innovation behaviors of individuals operating in rigorous academic and professional settings (Wang et al., 2022).

However, the organizational environment can also harbor deeply negative psychological stressors that severely impede the creative process. Workplace ostracism, characterized by the systemic exclusion or marginalization of an employee by their peers, operates through a detrimental chain mediating effect to significantly depress employee innovation behavior by rapidly eroding self-esteem and severely depleting finite cognitive resources (Xing & Li, 2022). Furthermore, basic physiological and psychological needs, such as the requirement for adequate sleep quality, interact heavily with factors like ethical leadership in complex dual-path models to influence service innovation; severe sleep deprivation can essentially neutralize the otherwise positive, motivational effects of supportive leadership (Rasheed et al., 2024). To successfully navigate these complex socio-psychological barriers, cultural intelligence emerges as a vital cognitive asset. High cultural intelligence enables employees to

seamlessly bridge diverse cultural and cognitive perspectives, actively facilitating the critical knowledge sharing which, in turn, drives sustainable innovation behavior, a synergistic process heavily moderated by the overarching organizational culture (Hernawati, 2024). Ultimately, achieving a comprehensive understanding of employee innovation behavior strictly requires a deep dive into the underlying organizational psychology and culture, recognizing that every creative act is firmly embedded within a complex web of interpersonal relationships and unwritten psychological contracts (Du & Wang, 2022).

It is also critical to acknowledge that innovation is not consistently a linear or officially sanctioned organizational process. A rapidly growing body of literature recognizes the fascinating phenomenon of deviant innovation behavior—instances where employees stubbornly pursue novel ideas in secret, deliberately violating formal organizational norms, resource allocations, or direct managerial directives to protect their fledgling concepts from premature rejection. Using advanced game theory approaches, researchers have empirically demonstrated that while such deviant innovation behaviors carry significant inherent risks for the individual, they can paradoxically lead to massive organizational breakthroughs and substantially positively impact a firm's overall organizational innovation performance (Han et al., 2024). These highly unconventional pathways to creativity strongly underscore the necessity for robust organizational learning and strategic human capital development. When human capital is continuously refined and supported through structured organizational learning initiatives, it significantly elevates both the standard, formally sanctioned innovations and the deviant innovation behaviors of employees, ultimately driving vastly superior performance even in highly regulated sectors such as commercial banking (Isa & Muafi, 2022). The critical necessity for continuous learning is equally evident in specific technological and engineering domains, such as the construction industry, where deeply understanding the specific psychological mechanisms influencing green technology innovation behavior is absolutely crucial for achieving long-term sustainable development (Li et al., 2022). The modern innovation landscape is further complicated by the rapid integration of advanced technologies, most notably Artificial Intelligence. Integrating AI assistants presents a complex, double-edged sword effect on employees' innovation behavior; while these systems can drastically enhance rapid information processing and raw idea generation capabilities, they simultaneously have the potential to induce severe

algorithmic anxiety and a detrimental over-reliance, thereby potentially stifling deep, independent, and truly original creative thought (Yin et al., 2024).

While much of the existing literature heavily focuses on individual innovation behavior, the undeniable reality of the modern workplace is that complex problem-solving and breakthrough creativity are predominantly collaborative, team-based endeavors. Transitioning from individual-level analyses to collective team creativity requires a major theoretical paradigm shift in understanding precisely how distinct psychological profiles amalgamate within a group setting. Psychological diversity, representing the deep-level variance in core traits such as personality dimensions, cognitive processing styles, and fundamental human values among team members, is widely posited as a critical structural antecedent to group creativity. Teams that exhibit a high degree of psychological diversity intrinsically possess a significantly broader repository of specialized knowledge, a far wider array of interpretive perspectives, and highly unique heuristic approaches to problem-solving. Theoretically, this dynamic equips them to engage in superior divergent thinking and generate highly original, boundary-spanning solutions that traditional, homogeneous teams would likely overlook. However, psychological diversity is inherently volatile and universally represents a double-edged sword. The exact psychological differences that are absolutely necessary to spark creative, constructive friction can just as easily devolve into debilitating relational conflict, severe communication breakdowns, and fractured team cohesion, thereby completely neutralizing any potential creative advantage.

To effectively harness the immense creative potential of psychological diversity while systematically mitigating its destructive interpersonal tendencies, teams absolutely necessitate a highly robust regulatory mechanism. Emotional intelligence—defined here as the collective, aggregated capability of a team's members to accurately perceive, deeply understand, intuitively regulate, and effectively utilize emotions—serves as this crucial moderating and cohesive force. Teams characterized by a high degree of aggregate emotional intelligence are fundamentally vastly better equipped to gracefully navigate the inevitable interpersonal frictions and misunderstandings that naturally arise from deep-level psychological differences. These emotionally intelligent teams successfully cultivate an environment of unshakeable psychological safety, seamlessly facilitate empathetic communication, and possess the unique capability to

constructively channel sharply dissenting viewpoints into a productive, highly creative dialogue. Therefore, emotional intelligence is hypothesized within this research not merely as an isolated, additive factor promoting workplace harmony, but as the absolute essential psychological catalyst that actively unlocks and operationalizes the creative potential latent within psychologically diverse team structures.

Despite the growing theoretical consensus regarding the interconnected importance of team composition and shared affective states in driving organizational creativity, empirical investigations exploring these complex dynamics have frequently yielded wildly inconsistent, and occasionally contradictory, results. This persistent inconsistency within the academic literature may be largely attributed to the widespread, historical reliance on traditional linear analytical models. Conventional statistical techniques frequently struggle, and often fail entirely, to adequately capture the highly complex, synergistic, and potentially non-linear interactions that exist between multi-dimensional psychological constructs like deep-level psychological diversity and aggregate emotional intelligence. To directly address and bridge this critical methodological gap, the present study completely departs from traditional linear constraints and adopts a sophisticated machine learning approach, specifically utilizing the Random Forest regression algorithm. As a highly powerful ensemble learning method that constructs a vast multitude of decision trees, the Random Forest algorithm is uniquely capable of accurately modeling intricate, high-dimensional, and non-linear data spaces without being bound by the strict parametric assumptions of traditional statistics. This allows for a significantly more accurate, robust, and nuanced prediction of supervisor-rated team creativity based on complex psychological architectures. The aim of this study is to deploy a Random Forest machine learning algorithm to evaluate the predictive power and complex non-linear interactions of psychological diversity and team emotional intelligence on collective team creativity.

2 Methods and Materials

This study employed a cross-sectional, quantitative research design to investigate the predictive power of psychological diversity and emotional intelligence on team creativity using a machine learning approach. The research was conducted within the corporate sector of Greece, targeting organizations that rely heavily on collaborative

work environments and team-based problem-solving. To ensure a robust dataset for the predictive modeling, an exact sample of four hundred and twelve employees, nested within sixty-five distinct work teams, was recruited from various industries including technology, finance, and marketing located primarily in Athens and Thessaloniki. The inclusion criteria required that the teams had been working together for a minimum of six months, possessed clear shared objectives, and engaged in regular interdependent tasks. The sample consisted of individuals with diverse professional backgrounds, and participation was entirely voluntary and strictly confidential.

Data were collected using a comprehensive, multi-source survey methodology designed to minimize common method bias and accurately capture the variables of interest. Team creativity, the primary target variable, was assessed using a standardized, supervisor-rated scale to provide an objective evaluation of the team's innovative output. Supervisors evaluated their respective teams on dimensions such as the generation of novel ideas, the application of innovative processes, and the overall creative utility of the team's solutions. Emotional intelligence was measured using the self-reported Wong and Law Emotional Intelligence Scale, which captures four distinct dimensions including self-emotion appraisal, others-emotion appraisal, use of emotion, and regulation of emotion. Individual scores were subsequently aggregated to calculate a team-level emotional intelligence mean, provided that within-team agreement statistics justified this aggregation. Psychological diversity was operationalized through the assessment of deep-level personality traits using the established Big Five Inventory. To represent psychological diversity at the team level, the standard deviation and within-team variance of the personality traits were computed, capturing the dispersion of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience among team members. Additionally, demographic data including team size, gender composition, and average team tenure were collected to serve as control variables in the predictive models, ensuring that the isolated effects of emotional intelligence and psychological diversity could be accurately determined.

The analytical strategy centered on the deployment of Random Forest regression algorithms to predict team creativity based on the aggregated measures of psychological diversity and emotional intelligence. Prior to model training, the dataset underwent rigorous preprocessing procedures. Missing values were addressed using a k-nearest neighbors imputation technique, and all

continuous predictor variables were standardized using z-score normalization to ensure that variables with different scales contributed equally to the model. The dataset of sixty-five teams was partitioned into a training set comprising eighty percent of the data and a testing set containing the remaining twenty percent, allowing for an unbiased evaluation of the model's predictive capabilities. A Random Forest model, an ensemble learning method that constructs a multitude of decision trees during training and outputs the mean prediction of the individual trees, was selected due to its robustness against overfitting and its ability to handle complex, non-linear interactions between psychological variables. Hyperparameter tuning was conducted using a grid search with cross-validation to optimize the number of trees, the maximum depth of the trees, and the minimum number of samples required to split an internal node. The predictive performance of the optimized Random Forest model was evaluated on the unseen testing set using standard evaluation metrics, including the Root Mean Square Error (*RMSE*), the Mean Absolute Error (*MAE*), and the Coefficient of Determination (R^2). Furthermore, variable importance scores were calculated using the mean decrease in Gini impurity to quantify and rank the relative contribution of team emotional intelligence and the specific facets of psychological diversity in predicting team creativity, thereby providing deep psychological insights from the machine learning outputs.

3 Findings and Results

Prior to conducting the primary predictive analyses using the Random Forest algorithm, initial data screening and aggregation checks were performed to justify the team-level focus of the study. Because emotional intelligence was measured at the individual level using the Wong and Law Emotional Intelligence Scale, it was necessary to demonstrate sufficient within-team agreement to aggregate these scores to the team level for the sixty-five distinct work teams. The median within-group agreement index, denoted as $r_{wg(j)}$, was calculated for team emotional intelligence and yielded a value of 0.84, which comfortably exceeds the conventional threshold of 0.70. Furthermore, the Intraclass Correlation Coefficients were computed to assess the reliability of the team means. The values for *ICC*(1) and *ICC*(2) were 0.22 and 0.71, respectively, indicating that a significant proportion of the variance in emotional intelligence was attributable to team membership and that the team means were sufficiently reliable. Consequently,

individual emotional intelligence scores were averaged to form a single team-level metric. Psychological diversity was indexed by computing the within-team standard deviation for each of the Big Five personality traits. Descriptive statistics and bivariate correlations for the aggregated target variable, primary predictors, and continuous control variables are presented in the first table. Data regarding

categorical control variables not depicted in the table, specifically gender composition, indicated that teams had an average male-to-female ratio of 1.15, though gender diversity was not significantly correlated with the supervisor-rated team creativity criterion ($r = 0.08$, $p = 0.526$).

Table 1

Descriptive Statistics and Bivariate Correlations for Team-Level Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Team Creativity	3.85	0.62	–					
2. Team Emotional Intelligence	4.12	0.48	0.54**	–				
3. Openness Diversity (<i>SD</i>)	0.88	0.21	0.41**	0.18	–			
4. Extraversion Diversity (<i>SD</i>)	0.92	0.25	0.35*	0.22	0.14	–		
5. Conscientiousness Diversity (<i>SD</i>)	0.75	0.19	–0.28*	–0.11	–0.05	0.12	–	
6. Team Tenure (Years)	2.45	1.10	0.15	0.25*	0.09	0.03	0.18	–

The correlational analysis revealed initial support for the hypothesized relationships, demonstrating that team emotional intelligence possessed a strong, positive association with team creativity ($r = 0.54$, $p < .01$). Among the psychological diversity metrics, diversity in openness to experience ($r = 0.41$, $p < .01$) and diversity in extraversion ($r = 0.35$, $p < .05$) were significantly and positively correlated with creative outcomes. Conversely, diversity in conscientiousness exhibited a significant negative correlation with team creativity ($r = -0.28$, $p < .05$), suggesting that large variances in team member reliability and orderliness might hinder the creative process. Following these preliminary analyses, the dataset was partitioned into a training set of fifty-two teams and a testing

set of thirteen teams. The Random Forest regression model underwent rigorous hyperparameter tuning via five-fold cross-validation on the training data. The optimal model architecture consisted of five hundred decision trees, a maximum tree depth of eight, and a minimum of two samples required to split an internal node. To benchmark the efficacy of the machine learning approach, the predictive performance of the optimized Random Forest model was evaluated against a standard Multiple Linear Regression model using the unseen testing data. The comparative performance metrics, detailing the models' ability to generalize and accurately predict team creativity, are provided in the second table.

Table 2

Predictive Performance of the Random Forest Model versus Baseline Linear Regression on the Testing Set

Model	<i>R</i> ²	<i>RMSE</i>	<i>MAE</i>
Multiple Linear Regression	0.45	0.51	0.42
Random Forest Regression	0.68	0.34	0.27

The evaluation metrics clearly demonstrate the superiority of the Random Forest algorithm in capturing the complex, potentially non-linear dynamics between team composition and creativity. The Random Forest model explained a substantial sixty-eight percent of the variance in team creativity on the unseen test data ($R^2 = 0.68$), representing a considerable improvement over the forty-five percent variance explained by the traditional linear regression model ($R^2 = 0.45$). Furthermore, the error

margins for the ensemble method were significantly lower, yielding a Root Mean Square Error of 0.34 and a Mean Absolute Error of 0.27. The linear model's higher error rates ($RMSE = 0.51$, $MAE = 0.42$) indicate a struggle to account for the intricate interactions among the diverse psychological profiles. Beyond mere predictive accuracy, a primary objective of deploying the Random Forest algorithm was to extract theoretical insights by quantifying the relative importance of each predictor variable. Variable importance

was calculated using the mean decrease in Gini impurity, which measures how much each feature contributes to reducing the variance across all the decision trees in the forest. A higher importance score signifies that the variable played a more critical role in accurately predicting the

supervisor-rated creativity of the teams. The importance scores for all primary predictors and control variables were extracted from the optimized model and are systematically ranked in the final table.

Table 3

Variable Importance Scores for Predicting Team Creativity Derived from the Random Forest Model

Predictor Variable	Importance Score (Mean Decrease in Impurity)	Rank
Team Emotional Intelligence	0.345	1
Openness Diversity (<i>SD</i>)	0.212	2
Extraversion Diversity (<i>SD</i>)	0.158	3
Conscientiousness Diversity (<i>SD</i>)	0.115	4
Agreeableness Diversity (<i>SD</i>)	0.062	5
Neuroticism Diversity (<i>SD</i>)	0.054	6
Team Tenure	0.038	7
Team Size	0.016	8

The variable importance analysis elucidated that team emotional intelligence was the paramount predictor of team creativity, accounting for the highest proportion of impurity reduction within the model (0.345). This substantial contribution underscores the critical necessity of emotional regulation and empathetic engagement for facilitating the complex interpersonal dynamics required for team innovation. Following emotional intelligence, specific facets of psychological diversity emerged as highly influential. Diversity in openness to experience was the second most critical variable (0.212), confirming that a wide variance in intellectual curiosity and preference for novelty among team members significantly drives creative output. Extraversion diversity also demonstrated substantial predictive power (0.158), suggesting that a balance of highly outgoing and more reserved individuals optimizes the exchange and refinement of ideas. Interestingly, while conscientiousness diversity was ranked fourth (0.115), the preliminary correlational data indicated its effect was likely detrimental rather than facilitative. Other variables, including diversity in agreeableness (0.062) and neuroticism (0.054), along with structural control variables such as team tenure (0.038) and team size (0.016), contributed marginally to the model's predictive capabilities. The machine learning outputs conclusively isolate team emotional intelligence and deep-level diversity in openness and extraversion as the definitive psychological architectures underpinning team creativity in this organizational sample.

4 Discussion

The primary objective of this study was to deploy a sophisticated machine learning approach, specifically the Random Forest regression algorithm, to evaluate the predictive power and complex non-linear interactions of psychological diversity and team emotional intelligence on collective team creativity. The findings from the predictive modeling conclusively demonstrate that the Random Forest ensemble method significantly outperforms traditional multiple linear regression in forecasting team creativity. By explaining a substantial sixty-eight percent of the variance ($R^2 = 0.68$) in supervisor-rated creativity compared to the forty-five percent ($R^2 = 0.45$) explained by the linear model, the machine learning approach validates the theoretical premise that the psychological architectures underpinning team innovation are highly complex, deeply synergistic, and inherently non-linear. Furthermore, the variable importance analysis derived from the Random Forest model elucidated the hierarchical contribution of these psychological constructs, identifying aggregated team emotional intelligence as the paramount predictor, closely followed by deep-level diversity in the personality traits of openness to experience and extraversion. These results provide profound insights into the structural and affective prerequisites for cultivating highly innovative collaborative units within modern organizational settings.

The emergence of team emotional intelligence as the single most critical determinant of team creativity underscores the absolute necessity of affective regulation

and empathetic engagement in the collaborative innovation process. Creative endeavors inherently require individuals to navigate ambiguity, challenge established norms, and engage in constructive debate, all of which can easily trigger interpersonal friction and emotional volatility. A team characterized by high aggregate emotional intelligence possesses the collective capacity to accurately perceive these emotional shifts, gracefully manage interpersonal stressors, and maintain a climate of robust psychological safety. This finding aligns seamlessly with contemporary research emphasizing the foundational role of positive psychological states and interpersonal trust in driving innovative behaviors. For instance, the cultivation of robust psychological capital, facilitated by authentic and transformational leadership, has been shown to directly motivate employees to engage in service innovation by providing the emotional resilience necessary to sustain creative effort (Markus et al., 2018). Similarly, transparent and genuine leader-follower interactions that boost work engagement inevitably rely on a bedrock of emotional intelligence to foster the psychological safety required for specialized innovation in modern enterprises (Zhang et al., 2023). Furthermore, environments that actively promote ethical leadership and align individual moral values with broader organizational goals fundamentally depend on the emotional intelligence of the collective to navigate complex moral and creative dilemmas, particularly in the pursuit of sustainable or green innovation behaviors (Yang & Liu, 2022). The high importance score of emotional intelligence in our predictive model confirms that without this affective regulatory mechanism, the friction generated by diverse perspectives is likely to devolve into counterproductive conflict rather than constructive, creative dialogue.

Following emotional intelligence, the specific facets of psychological diversity, particularly variance in openness to experience and extraversion, emerged as highly influential predictors of team creativity. The machine learning outputs confirm that a wide variance in intellectual curiosity and a preference for novelty among team members significantly drive creative output. Teams that possess a broad spectrum of openness are intrinsically equipped with a vast repository of specialized knowledge and highly unique heuristic approaches, enabling them to engage in superior divergent thinking. This directly supports the perspective of personality psychology, which posits that the dynamic interplay of distinct intrinsic traits within a specific working environment profoundly dictates the capacity for innovative behavior (Yang & Wu, 2021). Furthermore, the predictive

power of extraversion diversity suggests that an optimal creative environment requires a delicate balance of highly outgoing individuals who can champion ideas and facilitate communication, alongside more reserved individuals who may excel in deep, focused cognitive processing. This functional diversity is critical for both the explorative generation of novel concepts and the exploitative refinement of those ideas into viable solutions, a dual necessity strongly emphasized in comprehensive organizational learning and leadership development frameworks (Kjellström et al., 2022). The successful integration of these diverse cognitive perspectives heavily relies on high-quality relational exchanges, where employees are provided with the necessary informational resources and psychological backing to engage in proactive innovation (Zhu & Tsai, 2024). Additionally, bridging these diverse cognitive and cultural perspectives requires significant cultural intelligence, which acts as a vital cognitive asset to seamlessly facilitate the critical knowledge sharing that drives sustainable innovation behavior (Hernawati, 2024).

Conversely, the preliminary correlational data and the variable importance ranking indicated that diversity in conscientiousness exerted a notable, yet potentially detrimental, influence on team creativity. The negative correlation suggests that large variances in team member reliability, orderliness, and adherence to deadlines might severely hinder the creative process. When a team comprises highly diligent, rule-bound individuals forced to collaborate with highly flexible, less structured peers, the resulting friction can rapidly erode team cohesion. This type of deep-level value incongruence can lead to systemic marginalization or interpersonal conflicts akin to workplace ostracism, which rapidly depletes finite cognitive resources and significantly depresses employee innovation behavior by eroding collective self-esteem (Xing & Li, 2022). Furthermore, the stress generated by severe mismatches in work ethic can act as a profound psychological stressor, potentially neutralizing the otherwise positive, motivational effects of supportive organizational structures, much like the detrimental impact of poor sleep quality on service innovation (Rasheed et al., 2024). These complex interpersonal dynamics strongly underscore the necessity for deep-rooted organizational competence and high-commitment human resource systems to actively manage group composition and secure deep-rooted commitment, translating diverse human capital into measurable performance outcomes (Mertiningsih et al., 2024; You & Park, 2024).

The superiority of the Random Forest algorithm in capturing these complex phenomena highlights a critical methodological advancement in the study of organizational behavior. Traditional linear models fundamentally fail to account for the intricate, interacting nature of psychological variables, such as the finding that diversity in openness is only beneficial when coupled with high team emotional intelligence. The machine learning approach successfully maps these non-linear boundaries, mirroring the complexity found in studies of highly unconventional pathways to creativity, such as deviant innovation behaviors. Research utilizing advanced game theory has empirically demonstrated that seemingly counterproductive or risky behaviors can paradoxically lead to massive organizational breakthroughs, a complex dynamic that linear models routinely obscure (Han et al., 2024). The modern innovation landscape, heavily influenced by digital human resource management and the integration of advanced technologies, requires analytical tools capable of handling immense complexity (Alrifae, 2025). For example, integrating artificial intelligence assistants presents a complex, double-edged sword effect on innovation behavior, enhancing rapid information processing while simultaneously potentially inducing algorithmic anxiety that stifles independent thought (Yin et al., 2024). Consequently, understanding the psychological mechanisms influencing complex outcomes, such as green technology innovation behavior, demands sophisticated analytical strategies that reflect the true intricacy of the underlying organizational psychology and culture (Du & Wang, 2022; Li et al., 2022). Ultimately, cultivating an environment that actively stimulates employee innovation behavior relies on a nuanced understanding of these deep-level psychological interactions, facilitated by continuous organizational learning and strategic human capital development (Isa & Muafi, 2022; Shaalan et al., 2022).

5 Conclusion

In conclusion, this study demonstrates that the psychological architecture underlying team creativity is inherently complex, highly interactive, and non-linear, necessitating advanced analytical approaches like machine learning for accurate prediction. By explaining 68% of the variance in team creativity, the Random Forest algorithm proved vastly superior to traditional linear models, confirming that the drivers of collective innovation cannot be understood in isolation. The findings firmly establish

aggregated team emotional intelligence as the most critical determinant of a team's creative capacity. High emotional intelligence serves as a foundational regulatory mechanism, creating the psychological safety required for individuals to take intellectual risks and navigate the inevitable interpersonal friction that arises during the creative process. Furthermore, the study reveals that deep-level psychological diversity operates as a double-edged sword within collaborative environments. While a high variance in traits such as openness to experience and extraversion significantly enhances divergent thinking and expands the team's conceptual boundaries, a wide disparity in conscientiousness acts as a strong deterrent to collaborative success. When teams possess conflicting work ethics, time management strategies, and structural preferences, the resulting process-related conflicts rapidly deplete the cognitive resources necessary for innovation. Ultimately, these empirical insights provide a crucial mandate for modern organizations. To cultivate truly innovative workforces, strategic human resource management must evolve beyond superficial demographic or functional diversity metrics. Instead, organizations must deliberately curate the nuanced psychological profiles of their collaborative units, intentionally balancing diverse cognitive perspectives while simultaneously ensuring high baseline levels of emotional intelligence and shared operational diligence. By prioritizing this sophisticated psychological alignment, leaders can successfully transform the inherent tensions of diverse human capital into a powerful, sustainable engine for collective creativity and organizational advancement.

While this study offers substantial theoretical and methodological contributions, several limitations must be acknowledged. First, the research utilized a cross-sectional design, which captures a specific snapshot of team dynamics at a single point in time. Because the variables were measured simultaneously, it is impossible to definitively establish strict causal relationships between psychological diversity, emotional intelligence, and team creativity. It remains plausible that highly creative teams naturally develop stronger emotional intelligence over time as a result of their successful collaborative experiences, rather than emotional intelligence acting solely as a precursor. Second, the sample was exclusively drawn from the corporate sector within Greece. While this provided a controlled cultural context for the predictive modeling, the specific cultural dimensions of Greece, such as its unique blend of collectivism and power distance, may limit the

generalizability of the findings to organizations operating in drastically different cultural landscapes. Third, although team creativity was objectively rated by supervisors to minimize bias, the psychological diversity metrics and emotional intelligence scores were derived from self-report inventories. Self-reported personality assessments are inherently susceptible to social desirability bias, wherein participants may unconsciously inflate their emotional intelligence or alter their personality profiles to align with perceived organizational ideals, potentially introducing noise into the machine learning algorithms.

To address these limitations and further advance the field, future research should prioritize longitudinal study designs. By tracking newly formed teams over an extended period, researchers can observe how psychological diversity influences the initial stages of group formation and how collective emotional intelligence evolves and moderates creative output throughout different phases of a project lifecycle. This temporal approach would provide robust evidence for causality and highlight critical developmental milestones within creative teams. Furthermore, future investigations should conduct cross-cultural comparative analyses. Replicating the Random Forest methodology across diverse global regions would establish whether the hierarchical importance of emotional intelligence and specific personality traits remains universal or fluctuates based on broader societal norms and organizational cultures. Additionally, future predictive models would benefit from the inclusion of complementary cognitive and structural variables. Integrating measures of cognitive style, such as analytical versus intuitive processing, along with specific task-complexity metrics, would create a more holistic and highly detailed algorithmic understanding of the multifaceted forces driving team innovation. Exploring the specific impact of virtual or hybrid work environments on these psychological dynamics also represents a critical frontier for future academic inquiry.

The findings from this machine learning analysis offer highly actionable suggestions for organizational practice and strategic human resource management. Organizations must fundamentally shift their team composition strategies away from focusing solely on functional expertise and actively incorporate deep-level psychological profiling. When assembling teams tasked with complex problem-solving or innovation, human resource professionals should intentionally select members to create a wide variance in openness to experience and a balanced distribution of extraversion, as these distinct cognitive perspectives are the

raw fuel for divergent thinking. However, managers must acutely recognize that diversity is a volatile asset. Therefore, it is imperative to implement rigorous emotional intelligence screening during the recruitment and team-formation phases to ensure the group possesses the inherent capability to regulate the inevitable friction caused by their psychological differences. Beyond selection, organizations should heavily invest in targeted emotional intelligence training programs for existing teams. By proactively teaching emotional regulation, active listening, and empathetic communication, companies can systematically equip their diverse workforce with the psychological tools required to transform interpersonal tension into a catalyst for breakthrough creativity. Finally, leadership training must emphasize the complex role of conscientiousness, teaching managers how to skillfully align differing work ethics and structural preferences to prevent process-driven conflicts from derailing the team's overarching innovative potential.

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.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

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

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