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Research Article

Examining the multifaceted nature of organizational justice: An integrated analysis using factor analysis and artificial neural networks

Örgütsel adaletin çok yönlü doğasının incelenmesi: Faktör analizi ve yapay sinir ağları kullanarak bütünleşik bir analiz

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Abstract

The study seeks to explore a composite model of organizational justice through the integration of exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and an artificial neural network (ANN). The inquiry consists of three separate phases. At first, the Delphi technique identifies various elements that make up organizational justice. Following this, the dimensions are subjected to EFA to reveal the underlying factorial structure of the concept. In the last phase, the identified factors are validated through Confirmatory Factor Analysis (CFA) and then prioritized using an Artificial Neural Network (ANN) to establish their relative importance. The EFA reveals a novel conceptualization of organizational justice, delineating its four distinct facets: distributive justice, procedural justice, interpersonal justice, and informational justice. This conceptualization is further validated through CFA. The ANN has been used to recognize and prioritize model variables as a triangulation. The study's results highlight procedural justice, informational justice, interpersonal justice, and distributive justice as key factors in the overall ambit of organizational justice. This study has significant implications for scholars and corporate executives, providing insights for training, human development, and policy-making. Furthermore, the model presented offers organizational management a valuable tool to ensure justice for employees and improve efficiency. The present investigation is a notable addition to the field of organizational justice as it incorporates artificial neural networks (ANN) as a research methodology, highlighting the crucial importance of justice in organizational settings.

Keywords: Organizational Justice, Distributive Justice, Procedural Justice, Interpersonal Justice, Informational Justice, Artificial Neural Network

Jel Codes: M52, M31, E24

Öz

Son yıllarda adından sıkça bahsedilen şebeke yoluyla pazarlama sistemi, pazarlama literatüründe Çalışma, keşifsel faktör analizi (EFA), doğrulayıcı faktör analizi (CFA), ve yapay sinir ağı (ANN) entegrasyonuyla örgütsel adaletin bir bileşik modelini keşfetmeyi amaçlamaktadır. İnceleme üç ayrı aşamadan oluşmaktadır. İlk olarak, Delphi tekniği örgütsel adaleti oluşturan çeşitli unsurları belirler. Bunu takiben, boyutlar keşifsel faktör analizine tabi tutularak kavramın altında yatan yapısı ortaya çıkarılır. Son aşamada, belirlenen faktorler doğrulayıcı faktor analizi (CFA) ile doğrulanır ve ardından onem derecelerini belirlemek için Yapay Sinir Ağı (ANN) kullanılarak onceliklendirilir. Keşifsel faktör analizi, dört farklı yönü belirleyerek örgütsel adaletin yeni bir kavramsallaştırmasını ortaya çıkarır: dağıtım adaleti, prosedürel adalet, kişisel adalet ve bilgilendirici adalet. Bu kavramsallaştırma, doğrulayıcı faktör analizi (CFA) ile daha da doğrulanır. ANN modelinin geliştirilmesi, model değişkenlerinin tanınması ve optimize edilmesini gerektirir. Çalışmanın sonuçları, örgütsel adaletin anahtar faktörleri olarak prosedürel adalet, bilgilendirici adalet, kişisel adalet ve dağıtım adaletini vurgular. Bu çalışmanın bilim insanları ve kurumsal yöneticiler için önemli sonuçları vardır, eğitim, insan gelişimi ve politika oluşturma çabaları için içgörüler sağlar. Ayrıca, sunulan model yöneticilere çalışan ihtiyaçlarını karşılamak ve verimliliği artırmak için değerli bir araç sunar. Mevcut araştırma, araştırma yöntemi olarak yapay sinir ağlarını (ANN) içeren örgütsel adalet alanına dikkate değer bir katkıdır, örgütsel ortamlardaki örgütsel adaletin kritik önemini vurgular.

Anahtar Kelimeler: Doğrudan Satış, Şebeke Yoluyla Pazarlama Sistemi, Distribütör

JEL Kodları: M52, M31, E24

Introduction

In recent years, organizational justice has emerged as a highly contested subject within business writing (Öztürk and Poyraz, 2021). The importance of the construct and its correlation with organizational, cultural, and management results has been extensively highlighted in numerous contexts, including academic spheres, mass media, online platforms, social communities, and even periodicals (Graso et al., 2020). The significant study by Krishnakumar and Neck (2002) effectively provided a framework and trajectory for the nascent discipline, highlighting the significance of comprehending the function of justice within the corporate context (Ilyas et al., 2022). Despite the growing scholarly attention to organizational justice, a notable absence of consensus persists about the conceptualization of organizational justice among employers and employees. (Tanwar and Prasad, 2016). In order to conduct systematic and scientific investigations on any phenomenon, it is imperative to establish a precise definition and a universally accepted method of measurement. Therefore, it is considered that the existing body of literature continues to encounter a substantial obstacle in both defining and conceptualizing organizational justice. (Bhatti et al., 2015; Bobocel, 2021). The concept of fairness among employees pertains to their perception of being inadequately compensated for the quantity or quality of their work, leading to unfair treatment (Setiawati and Ariani, 2020). The literature in this field has commonly used terms such as justice, perceived justice, fairness, injustice, perceived injustice, and unfairness interchangeably (Lips-Wiersma et al., 2022).

Organizational justice pertains to fairness and equality among employees within the workplace. Greenberg (1990) introduced the concept of "organizational justice" to validate perceptions of justice in the workplace. The role of the top-level manager and supervisor is crucial in establishing perceived organizational justice (Cropanzano et al., 2017; Akram et al., 2018). Decisions regarding employee performance and the establishment of justice perceptions are primarily made by top management (Huang et al. 2017). The emphasis is placed on justice when considering positive job outcomes, whereas the focus tends to be on inequality when discussing the health implications of workplace justice (Herr, Bosch et al. 2018). Understanding the development of organizational justice is crucial for comprehending its fundamental principles. This approach also integrates the key elements of justice literature and the recent expansion of overall justice. In light of the dynamic nature of the business landscape, organizations are actively seeking enhanced significance and purpose.

The recent recognition of this phenomenon has prompted a growing number of business leaders and intellectuals to underscore the significance of incorporating justice, fairness, and faith into business (Samara and Paul, 2019). The ever-changing challenges of the 21st century call for new research on organizational justice (Mulang, 2022). Unanticipated incidents that flagrantly break moral and social norms are incredibly unsettling, and as a result, justice perceptions change, necessitating ongoing research on organizational justice (Jones and Skarlicki 2013; Hoang et al. 2022).

Management researchers, on the other hand, claim that a descriptive approach frames organizational justice., i.e., “We are curious about how people behave., and they attempt to grasp workers' behavioural and attitude responses to a fair or unfair incidence by describing the possible consequences of a specific employee circumstance” (Dora and Azim 2019). Additionally, organizational justice is a subjective term concerned with what employees see and think to be right or fair rather than with objective facts (Gilliland 2018). Moreover, organizational justice researchers use philosophical notions to investigate them descriptively; specifically, they focus on how individuals behave when justice principles are respectfully settled or breached (Huang et al. 2017, Hoang et al. 2022). It should be considered that the recent changes and developments in the 21st-century call for new pursuits to recognize organizational justice, which will contribute to this being classified as a probable antecedent of many outcomes within the workplace (McCluney et al., 2021). The multi-dimensional construct of organizational justice makes it even more difficult to understand the phenomenon properly (Malla and Malla, 2022).

The global spread of the COVID-19 pandemic has led to significant negative consequences in numerous countries and regions across the globe (Asriati et al., 2022). The COVID-19 pandemic profoundly impacted human health and all aspects of human life, including socioeconomic conditions and organizations (Chi et al., 2021). Employees' behaviour constantly changes in response to evolving challenges (Chi et al., 2021). The COVID-19 pandemic has emerged as a significant catalyst, impacting employers and employees (Asriati et al., 2022). Exploring organizational behaviour from a fresh perspective is essential for understanding employee behaviour more deeply. Hence, the main aim of this study is to investigate a hybrid model of organizational justice that integrates exploratory factor analysis and confirmatory factor analysis with an artificial neural network.

Literature review

Organizational justice

The study of organizational justice initially centred around the equitable distribution of resources, commonly called distributive justice. From this foundational concept, several theories have emerged, with equity theory (Adams, 1965) serving as a fundamental framework. According to equity theory, individuals perceive fairness, justification, and accuracy when the outcomes they receive align with their contributions (Virtanen and Elovainio, 2018). For instance, if a colleague possessing equivalent qualifications receives additional benefits, employees may perceive this as an injustice, as it contradicts the principles of merit (Bennett and Marasi, 2015; Malla and Malla, 2022). Over time, the understanding of organizational justice has evolved, as demonstrated in Table 1. The table also acknowledges scholars who facilitated in improving the understanding of organizational justice.

Table 1: The evolution and progression of organizational Justice (Virtanen and Elovainio 2018)

Authors	Definitions/ Contribution
Adams (1965)	Equity Theory: People retain an unbiased association between performance and rewards. A fair balance between inputs and outputs is crucial.
Thibaut and Walker (1975)	Conflict Resolution: Involving a third party (mediation, arbitration) to resolve conflicts between employees and employers.
Leventhal (1976)	Equitable Distributions: Involves strives for proportional rewards based on efforts that benefit all concerned parties in the long run.
Bies & Moag (1986)	Interpersonal Treatment: Quality of treatment during procedural executions impacts perceptions of fairness.
Greenberg (1988)	Employee Perception: How employees view their organization's behaviour regarding decisions and their impact.
Greenberg (1990)	Interactional Justice: Framework with facets, further separating interactional justice into two dimensions.
Colquitt (2001)	Justice Measures: Developed constructs for distributive, procedural, informational, and interpersonal justice.
Loi & colleagues (2009)	Employee Reactions: Encompass justice responses to organizational events, including facets related to stable practices.

Distributive justice establishes the basis for organizational justice by investigating the fairness of results in resource allocation. It is important to remember that distributive justice is simply one aspect of organizational justice (Virtanen and Elovainio 2018). Similarly, two study groups have identified procedural justice as an important facet of organizational justice. According to their conflict resolution research, when workers were permitted to voice their opinions during the decision-making process, they perceived the outcome to be fairer and more equitable than when their viewpoints were ignored (Thibaut and Walker 1975). Another study by Leventhal found that people are more interested in learning about the judgments made on the distribution of rewards, benefits, and other important verdicts about how employees are treated at work. Employees in the workplace witness numerous events based on assumptions and beliefs. Even if the conclusion is appropriate, people perceive it as discriminatory and unfair (Jost 2020). Leventhal (1976) proposed fair procedural requirements, stating that decisions must be founded on correct, dependable, accurate information, unbiased, and agreeable to all stakeholders (Bobocel, 2021; Ospina et al., 2020). Interactional justice emerged as the next step in organizational justice (Bies and Moag, 1986; Greenberg, 1993; Dang and Pham, 2020).

Consequently, interactions with organizational representatives, resource distribution, and decision-making processes impact individual justice expectations. Interactional justice is separated into interpersonal and informational justice (Greenberg 1993). Interpersonal justice is defined as honest, pleasant, and friendly care with appropriate language among coworkers and top management, whereas informational justice is the dissemination of correct and accurate information to all stakeholders (Bies and Moag, 1986; Liang et al., 2021; Zhang et al., 2024).

Past research on organizational justice failed to encompass all four dimensions of justice perspectives, which are widely acknowledged and accepted (Colquitt et al. 2013; Ospina et al. 2020). Distributive justice (fairness of results), procedural justice (fairness of decision-making methods), interpersonal justice (respectful and dignified treatment), and informational justice (the truth of information) are all the key components of justice (providing ample justifications for decisions). Scholars have increasingly proposed that organizational justice (i.e., distributive, procedural, interpersonal, and informational) merge to influence the overall notions of justice (Mengstie, 2020; Zhang et al., 2024). In addition to various cross-sectional analyses, more recent research has shown that organizational trust significantly

predicts overall justice (Jiang et al., 2015). Several empirical studies proved that forms of organizational justice could predict overall justice (Karam et al., 2019; Estreder et al., 2020). Specifically, Ambrose and Schminke (2009) have conducted two studies on the workers of several organizations in the Southeast United States. Their first analysis established that procedural, distributive, and interactional justice were connected with overall justice (Arnéguy et al., 2020). Therefore, this research will encompass distributive, procedural, informational, and interpersonal justice while addressing overall justice (Baig and Ullah 2017).

Dimensions of Organizational Justice

Scholars have studied the effect of organizational justice on a set of specified metrics in inter-organizational settings, including relationship quality and satisfaction (Colquitt et al. 2001). Numerous studies have been conducted since the mid-2000s to study the specific characteristics of justice and their relationship-to-relationship management and, inevitably, performance (Zayer and Benabdelhadi 2020). The conceptualization of procedural and distributive justice components has been formulated to elucidate employees' perceptions of justice and the subsequent impact on their performance. Distributive fairness at the inter-organizational level pertains to the perception of how incentives, benefits, or resources are allocated in response to the level of effort exerted within the collaborative partnership. This concept enhances performance by mitigating opportunistic behaviour (Colquitt et al., 2013; Lips-Wiersma et al., 2022). Procedural justice pertains to equitability in the procedures employed to resolve conflicts and distribute resources. The utilization of this strategy enables positive organizational change and improves interpersonal relationships. (Bye and Sandal, 2015). Interactional justice focuses on how an individual is treated when making decisions (Gumusluoglu et al., 2013; Zhang et al., 2024). Figure 1 and Table 2 depict how the dimensions of organizational justice have been developed.

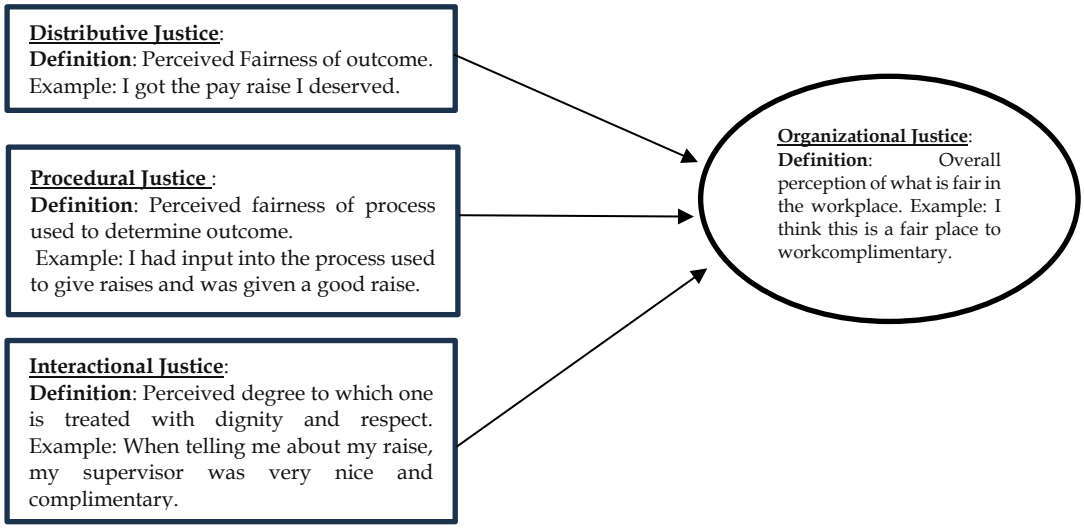

Figure 1 presents the dimensions of Organizational justice (Wu et al., 2020; Bouazzaoui et al., 2020)

Table 2: Facets of Organizational Justice (Four Facets) (Wu et al., 2020; Bouazzaoui et al., 2020)

Dimensions of Organizational Justice	Definition	Example
Distributive	Perception of fairness regarding the distribution of resources	"Higher sales were achieved compared to colleagues this year, yet they received a higher bonus. This situation is perceived as unfair."
Procedural	Perception of fairness of the processes used to distribute rewards	"How they make pay raise decisions around here does not seem fair. The favourites by authorities always get the largest pay raises."
Interpersonal	Perception of fairness of the treatment received by employees from authorities	"It was surprising that the boss found enough hours for employees last month. Given the downturn in business at the hotel, there was doubt whether sufficient tips would be earned to cover the rent".
Informational	Perception of fairness of the communication provided to employees from authorities	"When the employee asked their boss why they only received a 3 per cent pay raise, the boss spent an hour explaining which areas the employee needs to improve to earn a higher raise next year".

Informational justice pertains to the equity of information and explanations exchanged during discussions concerning information and its updates. Interpersonal justice, in contrast, relates to how individuals are treated by authorities and other relevant parties involved in executing procedures or making decisions. Interpersonal justice encompasses courtesy, integrity, and deference (Kakemam et al., 2021).

The scholarly literature consistently underscores the significant attention devoted to various justice dimensions within the existing body of research. Specifically, distributive and procedural justice have emerged as prominent topics, with a substantial number of publications dedicated to each—58 and 57, respectively (see Figure 2). Interactional justice, however, has received comparatively limited academic exploration, evident in only 20 publications focusing on this dimension. In contrast, informational and interpersonal justice have garnered even less scholarly attention, with a modest number of publications—seven and six, respectively (Bouazzaoui et al., 2020; Colquitt et al., 2013; Hoang et al., 2022; Zhang et al., 2024). Further, the past research also compellingly advocates for a comprehensive examination of organizational justice across all four dimensions rather than limiting the focus to three. Such an approach promises to enhance stakeholders' understanding of organizational justice (Colquitt et al. 2013; Ospina et al. 2020). The present study is aligned with this imperative. Figure 2 offers a succinct overview of prior research investigating organizational justice dimensions.

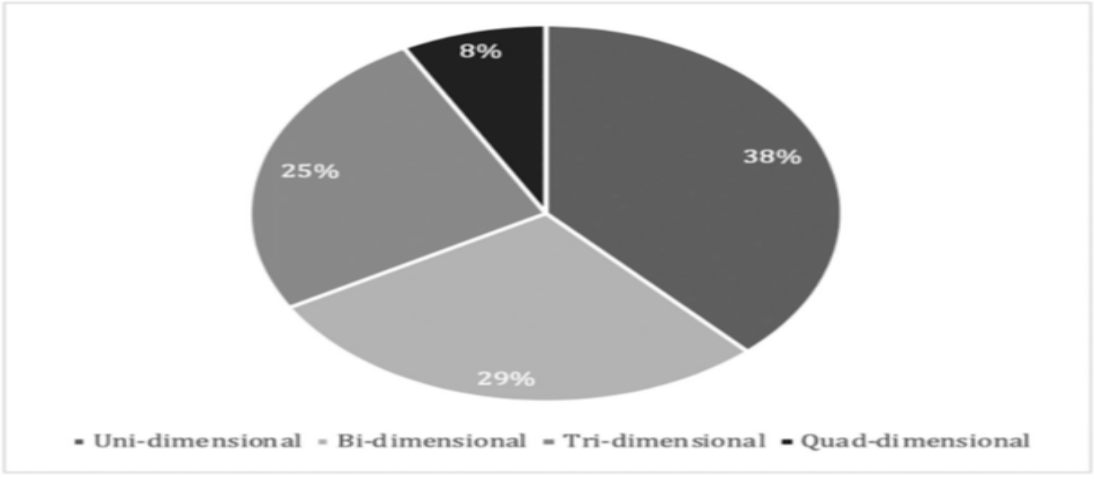

Figure 2: Justice Dimensions in Prior Studies (Wu et al., 2020; Bouazzaoui et al., 2020)

Organizational justice involves ensuring the equitable treatment of individuals in organizational contexts, encompassing multiple aspects of fairness (Arnéguy et al., 2020). In light of the natural inclination towards fairness among individuals (Van Jaarsveld et al., 2019), ethical quandaries present difficulties for managers and organizations (Bies, 1986). Continual investigation into organizational justice is imperative in light of the ever-changing dynamics of the 21st century. The necessity for such investigation becomes particularly crucial when facing unforeseen circumstances that disrupt ethical and societal standards (Jones and Skarlicki, 2013; Hoang et al., 2022). Nevertheless, the consistent implementation of justice principles, especially in delicate procedures like downsizing, continues to pose significant challenges (Cropanzano et al., 2017; Oliveira et al., 2020).

The literature emphasizes the many factors that impact managerial decision-making and ethical behaviour. Managers often encounter challenges when fulfilling their responsibilities, such as the apprehension of facing criticism and being held accountable (Rupp et al., 2017; Griep et al., 2022). Communicating challenging information can strain relationships and impact managerial perceptions of fairness (Mowen et al., 2023). In addition, managers must effectively manage immediate challenges and long-term implications, all while navigating complex hierarchical organizational structures (Colquitt et al., 2013; Hoang et al., 2022). To maintain professionalism, managers may face challenges in promoting fairness and upholding ethical principles (McCluney et al., 2021; Molinsky and Margolis, 2005; Fernández et al., 2021).

To summarize, organizational justice is an intricate and diverse concept closely connected to ethical decision-making and managerial practices. Comprehending and tackling these challenges is paramount in cultivating equity and confidence within organizations.

Collection of data and methodology for research

The current study is organized into three distinct sections. During the initial phase of the study, the Delphi method was employed to ascertain the various attributes of organizational justice. The next step was to use the dimensions found through the Delphi method in both an exploratory factor analysis and a confirmatory factor analysis to get to the heart of the idea of organizational justice. In the last step, an artificial neural network was employed to evaluate the relative significance of the identified parameters and assign them a hierarchical ranking. The scale utilized for evaluating organizational justice was derived from Colquitt's research and comprises 20 items. The scale's consistency was evaluated by calculating Cronbach's alpha coefficient, yielding a value of 0.89 (Colquitt, 2001) to measure distributive, procedural, interpersonal, and informational justice. The researchers adhered to Hair et al.'s (2017) advice when determining the appropriate sample size. According to their suggestion, the minimum sample size for factor analysis should be at least five times the number of studied variables (Hair et al. 2017). Thus, within the framework of the present study, it was concluded that a suitable sample size would be five times the number of variables under investigation. Based on the study's 20 variables, a sample size of 100 is appropriate. Data was collected through questionnaires using a convenience sample methodology.

The investigation focused on individuals employed in executive positions within the services sector in Pakistan, encompassing the target population. The choice of this specific environment was made due to its capacity to offer a substantial pool of well-educated individuals, particularly those with a strong command of the English language, who can efficiently complete the surveys. To maximize the response rate, the researchers distributed 600 questionnaires. A total of 500 questionnaires were received as a result of distributing questionnaires in the English language. Furthermore, following a comprehensive assessment, any surveys deemed odd, incoherent, or incomplete were excluded, as recommended by Hair et al. (2017). A total of 450 replies were deemed suitable for analysis. Before the data analysis, the questionnaires were thoroughly examined to identify any missing or inaccurate values. Table 2 illustrates a summary of demographic characteristics among the participants in the study.

Additionally, Table 3 presents the frequency distribution of the demographic factors among the study participants. The data has been classified based on various factors, including age, gender, marital status, educational qualifications, job designation, number of years in the current position, work experience, and number of employees. The table provided shows a significant difference in the gender distribution of the participants. Males make up the majority at 54.8%, while females account for 45.1%. It is expected that there will be a gender disparity in Pakistan as a result of the prevailing patriarchal norms. These norms restrict women's participation in corporate activities. However, there has been a concerning shift in this pattern within urban regions. The young girls' families now support and encourage them to pursue their academic goals and show their abilities by carrying out their duties.

The age distribution of the sample was as follows: 20.8 per cent were between the ages of 25 and 29, 37.1 per cent were between the ages of 30-34, 26 per cent were between the ages of 35 and 39, 12.8 per cent were between the ages of 40 and 44, and 3.1 per cent were aged 45 and above. The marital factors consist of 45.3 per cent of individuals who are married and 54.6 per cent of unmarried individuals. The educational qualifications of the sample reveal that 62 per cent hold a Master's degree, 20 per cent possess a Bachelor's degree, and 18 per cent have obtained a degree in MS/MPhil. As our data collection focused solely on the service sector, it is worth noting that all 450 respondents were exclusively from this sector.

The breakdown of total years of experience is as follows: 15.5% fall within the range of 1 to 5 years, 71.1% fall within the range of 6 to 10 years, and 13.3% fall within the range of more than 11 years. The company had a distribution of employees: 17% had 1 to 1000 employees, 28.8% had 1001 to 3000 employees, 33.3% had 3001 to 6000 employees, 15.5% had 6001 to 9000 employees, and 4.4% had above 9000 employees.

Regarding the organizational structure, it is worth noting that 20% of the workforce consisted of individuals in top management positions, while 54.8% held middle management roles. The remaining 25.1% were part of the supporting staff. In the present role, the duration of employment was distributed as follows: 26.6% of individuals held the position for 1 to 4 years, 64.4% for 5 to 8 years, 7.7% for 9 to 12 years, and 1.1% for more than seven years.

Table 3: Distribution of Participants Based on Sample Characteristics

Characteristics		**N 450**	**%**
Gender	Male	247	54.8
	Female	203	45.1
Age	25-29	94	21.0
	30-34	167	37.0
	35-39	117	26.0
	40-44	58	13.0
	45 and above	14	3.0
Marital status	Married	204	45.3
	Unmarried	246	54.6
Qualifications	Bachelors	90	20.0
	Master	279	62.0
	MS/MPHIL	81	18.0
Industry	Services	450	100
Work Experience	1-5 Years	70	15.5
	6-10 Years	320	71.1
	11 and above	60	13.3
Number of employees in the company	1-1000	80	17.0
	1001-3000	130	28.8
	3001-6000	150	33.0
	6001-9000	70	15.0
	Above 9000	20	6.0
Position in the Organization	Top	90	20.0
	Middle	247	54.8
	Support Staff	113	25.0
No. of Years in Current Position	1- 4 years	120	26.6
	5-8 years	290	64.4
	9-12 Years	35	7.7
	Above 12 Years	5	1.11

(Source: Author's computation)

Results of the study

Delphi method

At the outset, the Delphi approach has been utilized. The approach described is widely acknowledged as a highly effective strategy for fostering consensus among experts in a specific field or topic (McPherson et al., 2018; Bhatti et al., 2021). The RAND Corporation pioneered the Delphi technique in

the 1950s and 1960s, with significant contributions from Dalkey (1967, 1969) and Dalkey and Helmer (1963). The research instrument effectively organises and structures collective perspectives and viewpoints (Hong et al., 2019; Bhatti et al., 2021). The Delphi method is a research technique that enables a systematic and organized discussion on a specific topic, followed by the consolidation of perspectives from a specialized group (Stelten et al., 2021). Decisions are made based on the perspectives held collectively within a group, as evidenced by the following: Usually, this approach consists of several periods where participants can share their opinions through a survey. This framework enables a group to reach a consensus using a predetermined criterion (Stelten et al., 2021; Bhatti et al., 2021).

This study is a significant investigation that was conducted in Pakistan. During the initial phase, a carefully chosen group of 30 prominent business entities in the service sector were selected to participate. Their valuable insights and justifications regarding the concept of organizational justice were sought. The participants were asked to explain the reasoning behind the organisational justice concept and identify the sub-variables that make up this construct. It is important to note that the responses were obtained from the existing literature. In the second round, the researchers employed the organizational justice scale to evaluate the degree of organizational justice and the various sub-dimensions. Following the conclusion of this phase, the questionnaire underwent thorough analysis. The questionnaire used in the third round was structured similarly to the one employed in the second phase, employing a rating system of 5.

Exploratory factor analysis (EFA) and Confirmatory Factor Analysis (CFA)

Exploratory Factor Analysis (EFA) is a statistical method used to examine the relationships between observable variables and represent these relationships by incorporating one or more latent variables (Goretzko et al., 2021). The exploratory factor analysis (EFA) is followed by the confirmatory factor analysis (CFA). Accordingly, it is advisable to prioritize using EFA, particularly when employing the same instrument in a diverse cultural context or setting (Orçan, 2018). Furthermore, according to Byrne (2010), EFA is a valuable statistical method for identifying variables that deviate from the norm, thereby facilitating the organization of data to apply SEM (structural equation modelling) (Byrne, 2010; Bougie & Sekaran, 2019).

As previously specified, 450 valid responses were utilized for the analysis. Significantly, exploratory factor analysis was conducted **to determine** the most likely underlying factors, using the principal component extraction method with varimax rotation—a data reduction technique in SPSS. This analysis was performed on all the items included in the questionnaire. This method aided in identifying the potential crucial factors. The EFA results have confirmed that the Kaiser-Meyer-Olkin (KMO) statistic, which assesses the adequacy of the sample for all variables, exceeded the threshold of 0.85 (refer to Table 4). The KMO statistic exceeding the threshold indicates that the overall matrix is suitable for factor analysis (Pallant, 2016).

Table 4: KMO and Bartlett's Test

Test/Measure	**Statistic**	**Value**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.865
Bartlett's Test of Sphericity	Approx. Chi-Square	5529.631
	DF	1378
	Sig.	.000

Likewise, it was conceptualized that organizational justice has four dimensions: Distributive Justice, Procedural Justice, Interpersonal Justice, and Informational Justice. The scale was adopted from Colquitt's (2001), and the reason behind conducting EFA was to explore the principal dimensions of Organizational Justice within the organizational context of Pakistan (see Table 5)

Table 5: Exploratory Factor Analysis of Organizational Justice

Item Codes	**Communalities**	
POJ25	.708	Procedural Justice
POJ26	.765	Procedural Justice
POJ27	.802	Procedural Justice
POJ28	.801	Procedural Justice
POJ29	.791	Procedural Justice
POJ30	.212	Procedural Justice (not included in further analysis)
POJ31	.258	Procedural Justice (not included in further analysis)
DOJ32	.697	Distributive Justice
DOJ33	.670	Distributive Justice
DOJ34	.763	Distributive Justice
DOJ35	.564	Distributive Justice
INTOJ36	.641	Interpersonal Justice
INTOJ37	.651	Interpersonal Justice
INTOJ38	.653	Interpersonal Justice
INTOJ39	.572	Interpersonal Justice
INFOJ40	.772	Informational Justice
INFOJ41	.839	Informational Justice
INFOJ42	.837	Informational Justice
INFOJ43	.798	Informational Justice
INFOJ44	.761	Informational Justice

(Source: Author's computation)

According to the factor analysis, Bartlett's Test of Sphericity was statistically significant. The results presented a higher chi-square value of 5218.932 at a significance level 0.000. Similarly, the Kaiser-Meyer-Olkin (KMO) test (see Table 4) confirmed sampling adequacy as the value was 0.865, more than 0.50. In addition, the correlation matrix table indicated no multicollinearity in variables as values are less than 0.80.

Table 6 displays the extraction of four components from the concept of organizational Justice. Twenty (20) factors in organizational justice were ultimately determined. Concerning the outputs of the exploratory factor analysis (EFA), four factors were employed to analyse the EFA indices. Each subfactor was associated with one EFA factor, indicating that all factors accurately capture the whole variation of each variable. The rotated component matrix, as presented in Table 6, demonstrates that no cross-loadings are seen across the four dimensions of organizational justice. However, the two items (POJ30 and POJ31) exhibiting loadings lesser than 0.5 were excluded from further analysis (CFA and ANN).

Table 6: Rotated Component Matrix

Items	Procedural Justice	Distributive Justice	Interpersonal Justice	Informational Justice
POJ25	0.812			
POJ26	0.756			
POJ27	0.855			
POJ28	0.796			
POJ29	0.788			
DOJ32		0.712		
DOJ33		0.632		
DOJ34		0.756		
DOJ35		0.845		
INTOJ36			0.789	
INTOJ37			0.745	
INTOJ38			0.698	
INTOJ39			0.856	
INFOJ40				0.896
INFOJ41				0.878
INFOJ42				0.896
INFOJ43				0.899
INFOJ44				0.878

The number of factors was decided based on the Eigenvalues and factor loadings. An eigenvalue of 1.0 was considered a cutoff value (Byrne, 2010; Bougie & Sekaran, 2019), which dropped below 1.0 after four factors (Table 7). The EFA results indicated that the items loaded well on the initially conceptualized factors under their respective factors. No item exhibited high loading under any other factor (multiple loading), indicating no requirement for reconsideration of factors due to any deviant loading of items. The four factors collectively explained 63.61% of the Variance. In addition, the scree plot (not included in this paper) was also inspected to verify the number of factors. Confirmatory Factor Analysis was carried out with several factors limited to four. The results confirmed the four factors indicated by the standardized factor loadings in Table 8.

Table 7: Eigen Values and Variance Explained

Components	Eigen Value	Variance Explained %	Cumulative Variance Explained %
1	3.074	21.17	21.17
2	2.772	19.11	40.28
3	2.218	15.29	55.57
4	1.204	8.03	63.61

Table 8: Confirmatory Factor Analysis – Factor Loadings

Dimension/Variable/Construct	Items	Standardized loadings
Procedural Justice	POJ25	0.831
	POJ26	0.785
	POJ27	0.862
	POJ28	0.798
	POJ29	0.801
Distributive Justice	DOJ32	0.774
	DOJ33	0.708
	DOJ34	0.749
	DOJ35	0.852
Interpersonal Justice	INTOJ36	0.818
	INTOJ37	0.802
	INTOJ38	0.724
	INTOJ39	0.841
Informational Justice	INFOJ40	0.832
	INFOJ41	0.867
	INFOJ42	0.888
	INFOJ43	0.871
	INFOJ44	0.880

The correlations listed in Table 9 showed moderate correlations between the factors. The correlations were above 0.5 because the factors belonged to the same construct (organizational justice). However, the correlations remained below 0.7, which could induce multicollinearity in any model using this scale.

Table 9: Correlation Matrix – Organizational Justice with its four dimensions

Variables	Procedural Justice	Distributive Justice	Interpersonal Justice	Informational Justice
Procedural Justice	1.00			
Distributive Justice	0.524***	1.00		
Interpersonal Justice	0.629***	0.512***	1.00	
Informational Justice	0.556***	0.508***	0.573***	1.00

*Note: *** significance at a confidence level of 0.01.*

Modelling variable ranking using artificial neural networks

"A neural network is a comprehensive analytical data modelling and mining technique commonly employed in technical applications to make predictions and classifications" (Abiodun et al., 2018; Bhatti et al., 2021). Artificial neural networks are predominantly utilized in several domains owing to their inherent computational prowess, adaptability, and user-friendly nature. Artificial neural networks are computational models well-suited for addressing complicated problems that exceed the capabilities of standard mathematical approaches and conventional problem-solving methods (Rivas et al., 2021). Neural networks can represent and simulate the relationships between input and output variables. An artificial neural network consists of input variables categorized based on their features.

This study employed an Artificial Neural Network to evaluate the prioritization of aspects of Organizational Justice. This study utilized the Statistical Package for the Social Sciences (SPSS) software. An artificial neural network (ANN) modelling technique was used to rank variables. The inputs represented organisational justice dimensions, including procedural, distributive, interpersonal, and informational justice (see Figure 3). The ANN model was used to analyze Organizational Justice as the output variable. This study utilizes the Multilayer Perceptron (MLP) method in conjunction with SPSS to develop a neural network. According to the case processing summary in Table 10, it is clear that 325 cases were assigned to the training sample, while the remaining 125 cases were allocated to the testing sample. All cases were included in the analysis. Table 11 offers valuable insights into the network information. The input layer consists of four facets: "procedural, distributive, interpersonal, and informational justice".

There are a total of four units, excluding the bias unit. Within the realm of rescaling procedures, the covariates undergo a standardisation process. The neural network architecture comprises a solitary, hidden layer containing three units. The study utilizes an activation function derived from the hyperbolic tangent function, with the dependent variable being organizational justice. The output layer comprises a solitary unit determined through a standardized method for rescaling dependent variables. The selected activation function is the identity function, whereas the error function is the sum of squares. In the present context, SPSS has produced a network diagram, as shown in Figure 4. The term "synaptic weight" pertains to the magnitude or intensity of a linkage between two nodes. The diagram depicts the arrangement of four input nodes, three hidden nodes, and one output node, symbolising organizational justice.

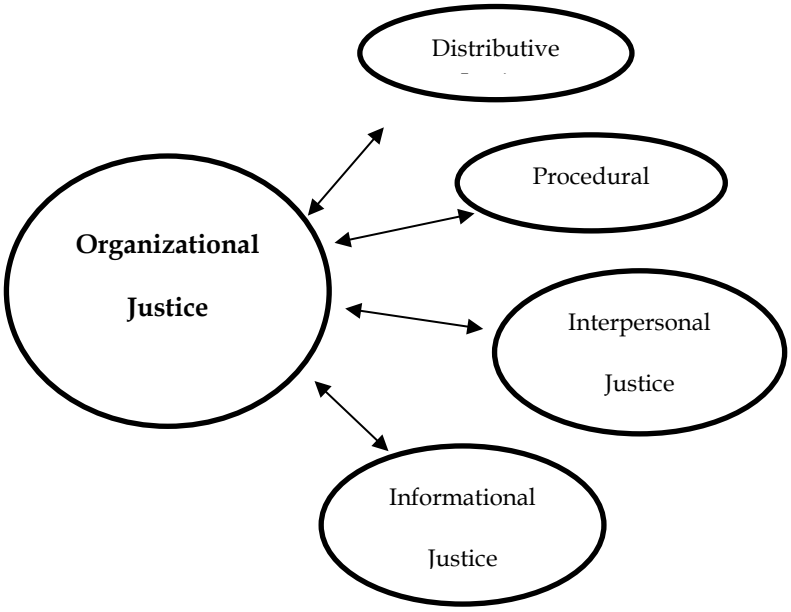

Figure 3: Network Diagram

Table 10: Case Processing Summary

		N	**Per cent**
Sample	Training	325	72.2%
	Testing	125	27.8%
Valid		450	100%
Excluded		0	
Total		450	

Presented in Table 12 is a thorough summary of the results achieved through the training process and subsequent application of the Multilayer Perceptron (MLP) network on the holdout sample. The output layer represents the sum of squares error, which is influenced by variables that depend on scale. This particular error function is the focus of the network's training, aiming to minimise and mitigate it. A stopping rule was implemented to ensure that progress was made only when a consecutive step decreased error, maintaining a rigorous and methodical approach. The relative error of the scale-dependent variable can be defined as the proportion of the observed sum of squares error in the "null" model. In this model, the projected value for each case is the mean value of the dependent variable. The average relative errors remain at 0.01 for the training and testing samples. Thanks to this consistent pattern, we can be confident that the network's error in future cases will closely align with the error reported in the table.

Table 13 presents an analysis of the significance of the independent variable concerning the dependent variable, taking into account the covariates. The current study examines the concept of organizational justice, which is operationalized through utilising four sub-constructs of organizational justice. According to the findings, procedural justice emerges as the most influential variable (100%), followed by informational justice (87.4%), interpersonal justice (64.2%), and the last influencing variable distributive justice (53%).

Table 11: Network Information

Input Layer	Covariates	1	PJ
		2	DJ
		3	INTJ
		4	INFOJ
	Number of Units		4
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1[a]		3
	Activation Function		Hyperbolic Tangent
Output Layer	Dependent Variables	1	OJ
	Number of Units		1
	Rescaling Method for Scale Dependents		Standardized
	Activation Function		Identity
	Error Function		Sum of Squares
Excluding the Bias			

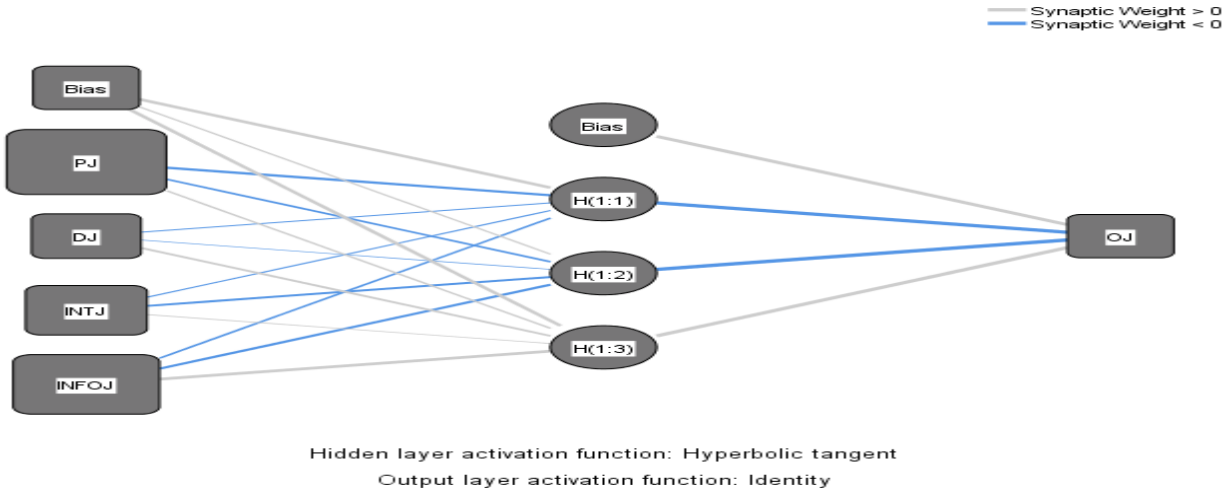

Figure 4: Ranked Effective Variables of Organizational Justice

Table 12: Model Summary

Training	A sum of Squares Error	.177
	Relative Error	.001
	Stopping Rule Used	1 consecutive step(s) with no decrease in error
	Training Time	0:00:00.05
Testing	A sum of Squares Error	.097
	Relative Error	.001
Dependent Variable: Organizational Justice		

Table 13: Independent Variable Importance

	Importance	**Normalized Importance**
PJ	.328	100.0%
DJ	.174	53.0%
INTJ	.211	64.2%
INFOJ	.287	87.4%

Figure 5 presents the normalized importance chart of the variables, which is derived from the significance of the independent variable. Various models were formulated by using different activation functions for the output layer. The purpose was to observe any change in the relative importance of the dimensions of organizational justice with alterations in activation functions. The activation function for the hidden layers was not changed, as SPSS offered only two activation functions, i.e., hyperbolic, tangent, and sigmoid. As the desired output was a continuous variable, a hyperbolic tangent activation function was selected for hidden layers. Different activation functions were used for output layers, and the results listed in Table 14 show that the importance did not change much with changes in activation functions.

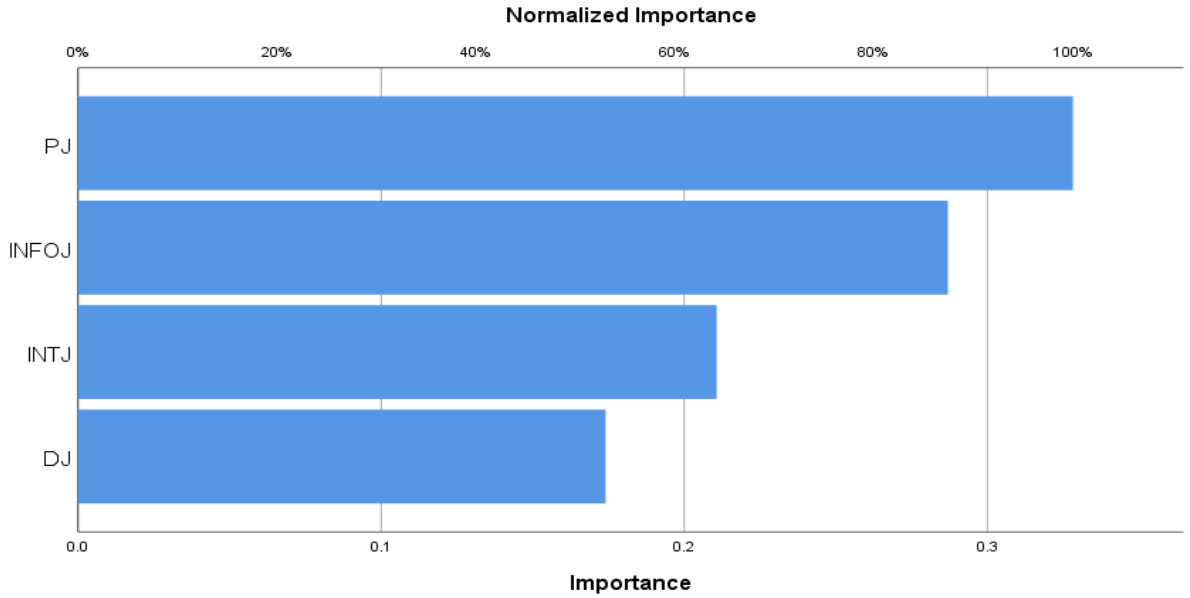

Figure 5: Ranked Effective Variables of Orbitational Justice

Table 14: Importance of Predictor variables using different activation functions

Variable	Activation Function							
	Identity		Softmax		Hyperbolic Tangent		Sigmoid	
PJ	.328	100.0%	.328	100.0%	.326	100.0%	.328	100.0%
DJ	.174	53.0%	.173	52.7%	.178	54.6%	.176	53.6%
INTJ	.211	64.2%	.212	64.6%	.217	66.5%	.210	66.5%
INFOJ	.287	87.4%	.287	87.5%	.282	86.5%	.289	86.5%

Conclusion and discussion

The present research examines a hybrid organisational justice model, combining factor analysis and artificial neural network techniques. Previous research in this domain has notably refrained from utilizing the hybrid methodology (Rivas et al., 2021). The factors about organizational justice were derived through the Delphi method and evaluated within a substantial sample size of 450 employees. The findings from the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) support the notion that the proposed model may account for the four key dimensions of organizational justice. The EFA and CFA findings undoubtedly present a novel conceptual framework for understanding organizational justice within the specific setting under investigation. It is well recognized that organizational justice encompasses four distinct components, namely procedural, distributive, interpersonal, and informational justice. The four elements above exemplify a robust correlation and comprise the primary construct known as organizational justice. The study's findings provide additional support for considering these aspects as crucial components in comprehending the concept of organizational justice from a Pakistani standpoint. A neural network model was constructed and improved by identifying and adjusting model variables.

The results obtained from the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) reaffirm the complexity of the organizational justice concept, which encompasses diverse dimensions falling under its overarching framework. The outcomes derived from the artificial neural network (ANN) modelling suggest a robust association between the four facets of organizational justice and perspectives on justice. Notably, in Pakistan, the significance of these four facets may not be uniformly distributed among all employees. The findings suggest that procedural justice is the most pivotal dimension among the four facets, followed by informational, interpersonal, and distributive justice. According to Nagin and Telep (2020), the fundamental values of trust-building, group consensus, and open communication present in collectivistic societies may be responsible for the prominence of procedural justice. According to Fernández et al. (2021), employees closely monitor managerial behaviour and attitudes, with any departure from standard practices or biased decision-making potentially leading to dissatisfaction and fostering workplace deviation.

Employees have expressed notable concerns regarding decision-making procedures by employers, particularly concerning matters directly affecting them, such as promotions, salary increments, and

career advancement. Employees in service industries accord greater importance to procedural and informational justice over distributive justice, aligning with findings from previous studies (Sulaiman Al-A'wasa et al., 2018; Öztürk and Poyraz, 2021). Moreover, the absence of procedural justice may elicit negative responses, particularly from individuals who perceive themselves as benevolent and entitled. These findings resonate with psychological contract theory, which underscores the substantial impact of the psychological contract on employee attitudes and behaviours within organizational settings (Piccoli and De Witte, 2015; Kutaula et al., 2020). As evidenced by the normalized importance figures, procedural justice takes precedence over informational justice regarding its significance.

According to scholarly literature, it is crucial to establish open and fair communication channels to create an environment characterized by trust and understanding (Malik et al., 2021). Lack of access to relevant information or the belief that information is intentionally hidden from employees can trigger the spread of rumours, a decrease in trust, and a feeling of disconnection (Hoang et al., 2022). To effectively mitigate negative consequences, one can achieve this by implementing decision reasons and promptly sharing knowledge (Malla & Malla, 2022).

In societies with a high power distance, where hierarchies and authority are highly regarded, views on interpersonal fairness may differ from those in cultures with a lower power distance (Guo et al., 2020). In high-power distance countries, it is crucial to acknowledge the importance of showing respect to higher authorities, cultural norms, and values in order to foster interpersonal relationships (Guo et al., 2020). When power dynamics are significant, employees frequently focus on developing strong connections with their superiors (Jnaneswar and Ranjit, 2021), which can impact relationships with colleagues. Interpersonal connections may not be as important as procedural and informational justice for various reasons. In cultures that emphasize high-power distance, there is a focus on collectivism, highlighting group harmony and cohesion (Ruano-Chamorro et al., 2021). In certain cultural contexts, the focus on group unity may overshadow the value of personal relationships, reducing the importance and standards of fairness in interpersonal interactions.

The unique characteristics of high-power distance cultures, like respect for authority, emphasis on roles, focus on outcomes, and hierarchical structures, significantly impact perceptions of distributive justice (Liang et al., 2021). Perceptions of distributive justice are significantly influenced by accepting hierarchical structures, emphasis on roles, and adherence to cultural norms. In high-power distance cultures, employees often hesitate to express their concerns about resource allocation due to restricted access and a lack of encouragement for open communication in the workplace. Encouraging clear communication about the reasons for incentive allocations and addressing perceived inequities can help foster a positive organizational environment. In societies with a notable power distance, employees might be discouraged from sharing their opinions and are typically advised to avoid discussing issues concerning the unequal distribution of resources (Öztürk and Poyraz, 2021).

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