

OPERATIONALIZING THE VUCA–BANI CONTINUUM: TOOLS, FRAMEWORKS, AND METHODS FOR MANAGING EXTREME UNCERTAINTY

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Abstract: *This study develops and empirically tests an integrative model of organizational effectiveness in the context of VUCA–BANI environments, emphasizing the role of socio-cognitive and structural mechanisms in shaping collective outcomes. Drawing on contemporary organizational theory, the model examines the relationships between trust in leadership, procedural and distributive justice, team effectiveness, and role-related stressors, including role conflict and role overload, within the Bulgarian Armed Forces. The findings highlight the dominant role of procedural justice as a central mediating mechanism through which trust in leadership is translated into team and organizational effectiveness. Compared to distributive justice, procedural justice demonstrates stronger and more consistent direct and indirect effects, underscoring the importance of transparent and predictable decision-making processes in conditions of high uncertainty. The results further reveal differentiated effects of role stressors: role overload exhibits a positive, adaptive function, while role conflict remains a weak but negative factor, particularly in structured organizational settings. Interpreted through the lens of complex adaptive systems theory, the study suggests that organizational effectiveness emerges from nonlinear interactions among trust, justice, and role structures rather than direct managerial control.*

Keywords: leadership, teams, organizational effectiveness, procedural justice

1. Introduction

Contemporary organizational and management research increasingly views the environment as a state of extreme uncertainty, which goes beyond classical models of rational management and linear predictability. In this context, two interrelated conceptual approaches have emerged: VUCA and BANI, which describe the evolution of uncertainty in complex systems. The VUCA framework emphasizes that organizations operate in an environment in which: cause-and-effect relationships are unclear (uncertainty); systems are interdependent (complexity); change is rapid and unpredictable (volatility); interpretations are ambiguous (ambiguity) [1], [2]. BANI adds new psychological and systemic dimensions: Brittle (fragility) - systems appear stable, but collapse

suddenly; Anxious (anxiety) - high levels of cognitive and organizational uncertainty; Nonlinear - small changes lead to large effects; Incomprehensible - limited possibility for rational explanation. "Operationalizing" VUCA–BANI means transforming abstract uncertainty into measurable and manageable mechanisms. There is a wide range of organizational constructs through which VUCA–BANI are operationalized in the contemporary literature - uncertainty, trust, ambiguity, procedural stability, social exchange, complexity/team dynamics, organizational performance, brittleness/anxiety, stress appraisal, adaptability, resilience, etc. This report tests a model in the Bulgarian Armed Forces that fits into the core of the cited studies and includes the following constructs: trust in leadership, teams,

perceived organizational effectiveness, procedural and distributive justice, and role conflict and role ambiguity.

Trust in leadership functions as a primary stabilizing mechanism that reduces perceived uncertainty and increases the predictability of the organizational environment [3]. It is directly related to the perception of organizational justice, influencing both procedural and distributive justice [4], [5].

Procedural justice, in turn, plays a key role in the legitimacy of management processes and is strongly related to cooperative behaviour and team effectiveness. Distributive justice complements this effect, but usually has a weaker contribution to collective outcomes compared to procedural justice. Both forms of justice act as mediators between trust and team effectiveness, creating conditions for coordination, shared goals, and reduced intragroup tensions [6], [7].

Team effectiveness represents an intermediate (meso) level in the model and is a direct predictor of organizational effectiveness [8], [9]. However, it is sensitive to role tensions, with role conflict and role ambiguity acting as destabilizing factors that reduce coordination and effectiveness at both the team and organizational levels [10]. These stressors are particularly pronounced in VUCA–BANI settings, where nonlinearity and cognitive unpredictability increase the likelihood of role conflicts and ambiguities.

At the systemic level, organizational effectiveness is viewed as an emergent outcome of the interaction between trust, justice, team processes, and role structures [11]. In a broader theoretical context, these relationships can be interpreted through the theory of complex adaptive systems, according to which organizations function through nonlinear interactions and emergent behaviour [12]. In this sense, VUCA–BANI is not a direct variable, but a contextual amplifier that moderates the strength and stability of the relationships between trust, justice, role structures, and organizational outcomes.

2. Empirical Research Design

The aim of the study is to analyse and empirically validate an integrative model of organizational effectiveness in the context of VUCA–BANI environment, by examining the role of trust in leadership, organizational justice, team effectiveness and role stress as interrelated mechanisms of influence.

Objectives

1. To analyse the direct and mediated (indirect) effects of trust in leadership and team effectiveness on perceived organizational effectiveness by examining the mediating role of procedural and distributive justice.

2. To assess the contribution of procedural and distributive justice, team effectiveness, trust in leadership and stress (role conflict and role ambiguity) to perceived organizational effectiveness.

Hypotheses

H1: Trust in leadership has a direct and mediated (indirect) effect on perceived organizational effectiveness, with the mediating role being played by procedural and distributive justice, as well as team effectiveness.

H2: Adding team effectiveness, trust in leadership, and role characteristics (role conflict and role ambiguity) to the model will lead to a statistically significant increase in the explained variance in perceived organizational effectiveness

2.1. Sample

The research sample includes 1,494 military personnel from 33 units across the country. The sample is a two-stage cluster sample and is representative of the Bulgarian Armed Forces. The study was conducted in November 2025 under the title “Motivation of personnel in the formations of the Bulgarian Armed Forces”.

In terms of gender distribution, the participants are mostly male (78.5%), while female make up 21.5%, which reflects the specific demographic structure of the studied population.

From the perspective of international experience, the majority of respondents (75.2%) have not participated in missions

abroad, which suggests that their perceptions are formed mainly within the national organizational context.

In terms of military status, the sample is heterogeneous and covers different hierarchical levels: the largest share is held by military personnel in the category of soldiers/marine (42.5%), followed by sergeants/petty officers (35.8%). The officer corps is represented to a lesser extent, including junior officers (14.6%), senior officers (5.4%), as well as officer candidates (1.6%).

This sample structure ensures representativeness across operational levels in the organization, with executive and tactical roles dominating, which is particularly relevant for examining perceptions related to leadership, fairness, and organizational effectiveness in dynamic and hierarchical environments.

2.2 Method

The study was conducted using a quantitative, cross-sectional design based on a survey. Data were collected using a standardized questionnaire (38 in total), including validated scales for measuring the main organizational constructs. The questionnaires were administered by order of the Minister of Defence, and all military personnel present in the military units on the day of the survey completed the distributed questionnaires. There are some missing responses for individual items in the questionnaires, but these vary across the different questionnaires. The present report examines the interrelationships among some of the variables included in the measurement process. All variables were measured using multi-point Likert scales. The following constructs were used: perceived organizational effectiveness (3 items; $\alpha = .73$), procedural justice (7 items; $\alpha = .87$), distributive justice (3 items; $\alpha = .83$), Team effectiveness (8 items; $\alpha = .90$), trust in the leader (12 items; $\alpha = .90$), role overload (4 items; $\alpha = .71$), role conflict (13 items; $\alpha = .84$). All scales showed good to excellent

internal consistency (Cronbach's $\alpha \geq .70$), which confirms the reliability of the measurements. The data were analysed using the following statistical methods: descriptive statistics, correlation analysis, linear regression, mediator analysis, hierarchical regression. The methodological framework combines descriptive, correlational and causal-analytic approaches, which allows for the simultaneous study of direct effects (regression), indirect effects (mediation) and incremental explanatory power (hierarchical regression). The adopted integrative approach is suitable for the analysis of complex organizational systems in a VUCA–BANI environment.

2.3 Descriptive Statistics

The descriptive characteristics of the variables are presented in Table 1.

The results show good variability and a clear distinction between the main organizational constructs. Perceived organizational effectiveness ($M = 15.97$; $M/\text{item} = 4.03$) is high, reflecting a positive assessment of functioning, with relatively low variability. Procedural justice ($M/\text{item} = 3.24$) is rated lower and is characterized by large differences in perceptions, which suggests potential problems in organizational procedures. In contrast, distributive justice ($M/\text{item} = 3.82$) is perceived more positively, which is typical of organizational contexts where results are valued more than processes.

Team effectiveness ($M/\text{item} = 4.06$) and trust in the leader ($M/\text{item} = 4.06$) have the highest values, which defines them as key strengths of the organization. These indicators also demonstrate relative stability. Role overload ($M/\text{item} = 3.22$) is moderately expressed, while role conflict ($M/\text{item} = 2.74$) is less pronounced. The general profile outlines an organization with strong social and leadership resources, moderate perceived justice, and controllable but present stressors.

Table 1. Descriptive statistics and reliability of study variables

Variable	N	Min	Max	M	SD	M Per item
Perceived Organizational Effectiveness	1481	4.00	20.00	15.97	2.73	4.03
Procedural Justice	1370	7.00	35.00	22.69	5.41	3.24
Distributive Justice	1487	3.00	15.00	11.45	2.28	3.82
Team Effectiveness	1474	11.00	40.00	32.45	5.17	4.06
Trust in Leader	1447	13.00	60.00	48.28	8.88	4.06
Role Overload	1483	4.00	20.00	12.87	2.99	3.22
Role Conflict	1456	10.00	45.00	30.35	4.37	2.74

Note. *N* = sample size; *Min* = minimum; *Max* = maximum; *M* = mean; *SD* = standard deviation; α = Cronbach's alpha

The distinction between procedural and distributive justice is particularly important, as the former may play a key mediating role despite its lower values. The data are consistent with subsequent regression and mediation analyses. High levels of trust and team effectiveness suggest strong direct effects. Variability in justice allows for the study of mediating dependencies. The

presence of role stressors creates conditions for the analysis of negative effects in the model

3. Analysis of the Results

3.1 Correlation analysis

The correlation coefficients are presented in Table 2

Table 2 Correlations among study variables

Variable	1	2	3	4	5	6
1. Role Overload	-					
2. Role Conflict	.199**	-				
3. Trust in Leader	.003	.277**	-			
4. Team Effectiveness	-.028	-.043	.534**	-		
5. Procedural Justice	.011	-.148**	.457**	.410**	-	
6. Distributive Justice	.045	-.044	.335**	.337**	.493**	-
7. Perceived Organizational Effectiveness	.239**	-.016	.390**	.498**	.464**	.365**

Note. Values represent Pearson correlation coefficients. ** $p < .01$ (2-tailed).

The correlation analysis shows a clearly structured positive network between the key organizational constructs. Trust in the leader is strongly and significantly related to team effectiveness ($r = .534$), procedural justice ($r = .457$), and perceived organizational effectiveness ($r = .390$), confirming its central role in the model.

Team effectiveness demonstrates the strongest relationship with organizational effectiveness ($r = .498$), positioning it as a key mediating construct. Procedural and distributive justice also show significant

positive relationships with the outcome variables, with procedural justice having a stronger overall effect.

Role conflict and role overload show weak to non-significant relationships with the main positive constructs, with only role overload having a weak positive relationship with organizational effectiveness ($r = .239$).

3.2 Direct and mediated (indirect) effects of trust in leadership and team effectiveness on perceived organizational effectiveness by examining the mediating role of procedural and distributive justice

The results test the relationships between the variables defined by the following mediation model (Figure 1):

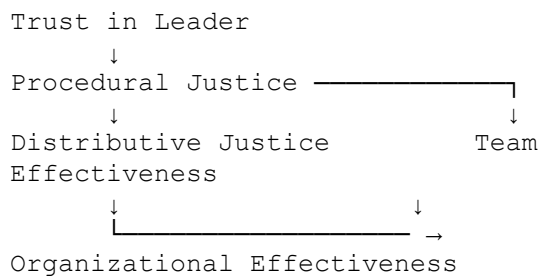


Figure 1: Core mediation chain

3.2.1 Direct and indirect effects of team effectiveness on perceived organizational effectiveness

The results obtained indicate a multiple mediation model. The independent variable team effectiveness shows significant positive effects on the two mediators: procedural justice ($\beta = 0.410$, $p < .001$) and distributive justice ($\beta = 0.337$, $p < .001$), explaining 16.8% and 11.3% of their variance, respectively. Both mediators, in turn, are significant predictors of the dependent variable perceived organizational effectiveness in the general model (procedural justice: $\beta = 0.373$, $p < .001$; distributive justice: $\beta = 0.186$, $p < .001$), which explains 24.1% of the variance.

The overall effect of team effectiveness on perceived organizational effectiveness is strong ($\beta = 0.498$, $p < .001$; $R^2 = .248$). The indirect effects through the two mediators are positive and of moderate size ($a_1 \times b_1 = 0.081$; $a_2 \times b_2 = 0.033$), with a total indirect effect of 0.114, which represents a substantial share of the total effect.

3.2.2 Direct and indirect effects of trust in the leader on team effectiveness

Regarding this variable as well, the results support a multiple mediation model, in which trust in the leader has a significant impact on both the mediator procedural justice ($\beta = 0.457$, $p < .001$; $R^2 = .208$) and distributive justice ($\beta = 0.335$, $p < .001$; $R^2 = .112$). In turn, both mediators are significant predictors of team effectiveness (procedural justice: $\beta = 0.410$, $p < .001$; distributive justice: $\beta = 0.337$, $p < .001$), indicating that

they mediate part of the effect of the independent variable.

The overall indirect effect (0.174) is of substantial size, with the contribution of procedural justice (0.108) being larger than that of distributive justice (0.066). At the same time, the direct effect of trust in the leader on team effectiveness remains strong and significant ($\beta = 0.534$, $p < .001$), indicating that the mediation is partial, not complete.

3.2.3 Direct and Indirect Effects of Trust in the Leader on Organizational Effectiveness

The results support a statistically significant parallel mediation model. The independent variable trust in the leader significantly predicts both mediators – procedural justice ($\beta = 0.457$, $p < .001$; $R^2 = .208$) and distributive justice ($\beta = 0.335$, $p < .001$; $R^2 = .112$), indicating moderate to medium explanatory power.

Both mediators are significant predictors of the dependent variable perceptions of organizational effectiveness: the effect of procedural justice is stronger ($\beta = 0.464$, $R^2 = .215$) compared to that of distributive justice ($\beta = 0.365$, $R^2 = .133$). The overall effect of trust in the leader on perceptions of organizational effectiveness is also significant ($\beta = 0.390$, $p < .001$; $R^2 = .152$).

The indirect effects are positive and of meaningful size (total 0.103), with the contribution of procedural justice (0.065) exceeding that of distributive justice (0.038). This indicates that a significant portion of the influence of trust in the leader on perceptions of organizational effectiveness is transmitted through the mediators.

Since the direct effect remains significant, the model reflects partial mediation, in which the effect is realized simultaneously through direct and indirect routes, with the mediator procedural justice playing a dominant role.

3.2.4 The comparative analysis of the four mediation models shows a clear distinction in the role of the studied mediators.

The model with the participation of role conflict (trust in the leader $\rightarrow$ role conflict $\rightarrow$ team effectiveness) does not

demonstrate a mediating effect, since the path from the mediator to the dependent variable is statistically insignificant, and the indirect effect is negligibly small. In contrast, the models including procedural and distributive justice consistently show significant partial mediation. The strongest indirect effect is observed in the model trust in the leader $\rightarrow$ (procedural justice, distributive justice) $\rightarrow$ team effectiveness ($\Sigma_{ind} = 0.174$), which indicates that the influence of trust in the leader on team effectiveness is significantly mediated through these mediators. A similar, but weaker, mediation effect is found in the model team effectiveness $\rightarrow$ (procedural justice, distributive justice) $\rightarrow$ perception of organizational effectiveness ($\Sigma_{ind} = 0.114$) and in the model trust in the leader $\rightarrow$ (procedural justice, distributive justice) $\rightarrow$ perception of organizational effectiveness ($\Sigma_{ind} = 0.103$). In all cases, the direct effects remain statistically significant, indicating partial, rather than full, mediation.

Based on the analyses carried out, it can be

argued that the first hypothesis is confirmed, which postulates that trust in leadership has a direct and mediated (indirect) effect on perceived organizational effectiveness, with the mediator role being played by procedural and distributive justice, as well as team effectiveness.

In summary, the results support a robust partial mediation model in which trust in the leader influences the final variables both directly and indirectly through procedural and distributive justice, with a dominant role for procedural justice, while role conflict does not function as an effective mediator.

3.3 Contribution of procedural and distributive justice, team effectiveness, trust in leadership and stress (role conflict and role ambiguity) to perceived organizational effectiveness

The contribution of the variables to perceived organizational effectiveness was assessed by applying hierarchical regression (Table 3).

Table 3. Hierarchical regression (DV: Perceived Organizational Effectiveness)

Model	Predictor	R	R ²	ΔR^2	β	F	p
1.	Procedural Justice Distributive Justice	.487	.237	—	.351*** .205***	201.95	< .001
2.	+ Team Effectiveness	.572	.328	.091	.335***	211.36	< .001
3.	+ Trust in Leader	.577	.333	.005	.088**	162.05	< .001
4.	+ Role Overload Role Conflict	.623	.389	.056	.242*** - .056*	137.46	< .001

Hierarchical regression shows a consistent and statistically significant increase in the explained variance of the dependent variable perceptions of organizational effectiveness when new predictors are added. The baseline model with the mediators' procedural and distributive justice explains 23.7% of the variance, with both predictors being statistically significant, with a stronger effect of procedural justice.

The addition of team effectiveness leads to a significant increase in the explained

variance ($\Delta R^2 = .091$), indicating that team effectiveness has an independent and strong contribution to the explanation of organizational effectiveness perceptions, even after controlling for the mediators. In this model, the effects of procedural and distributive justice decrease, suggesting a partial overlap in their explanatory power with that of team effectiveness.

The introduction of trust in the leader leads to a minimal but statistically significant improvement in the model ($\Delta R^2 = .005$),

indicating a weak additional contribution to the dependent variable.

The most complex model, including role overload and role conflict, achieved the highest explained variance ($R^2 = .389$). Role overload has a strong positive effect, while role conflict has a weak negative effect. In this final model, all main predictors remain statistically significant, indicating that their effects are independent and additive.

The analyses carried out support the second formulated hypothesis, according to which the addition of team effectiveness, trust in leadership and role characteristics (role conflict and role ambiguity) to the model will lead to a statistically significant increase in the explained variation in perceived organizational effectiveness compared to the model.

In conclusion, the model shows a steady increase in explanatory power at each step, with the strongest predictor in the final model being role overload, with the most robustly demonstrated effects – procedural justice and team effectiveness (constantly significant); role conflict a weak and negative effect. The overall model explains 38.9% of the variance in perceived organizational effectiveness, which is a moderate to good level of explanation.

4. Discussion

The results of the present study clearly highlight the asymmetric significance of the organizational mechanisms under study, highlighting two central lines of influence: (1) the dominant role of procedural justice as the main mediator and (2) the significant but differentiated impact of the stressors – role conflict and role overload.

First, procedural justice emerges as the strongest and most consistent predictor in the model. Its influence exceeds that of distributive justice in both direct and indirect effects, which is consistent with the theoretical statements of [13], [14]. While distributive justice reflects the evaluation of outcomes, procedural justice structures the very perception of legitimacy and

predictability of the organizational environment. It is this characteristic that makes it particularly critical in VUCA–BANI environments, where uncertainty is high and organizational members rely more on “how” decisions are made than on “what” they receive as an outcome [1], [14].

The present results show that procedural justice functions as a key translational mechanism through which trust in leadership translates into team and organizational effectiveness. Its higher mediation effects compared to distributive justice confirm that process stability is more important than equality of outcomes in complex organizational systems. This observation is particularly relevant for hierarchical structures such as military organizations, where procedural clarity is key to coordination and collective action.

In a broader theoretical perspective, these results support the understanding of organizations as complex adaptive systems [14], in which the effects of individual factors are not linear, but depend on the context and interactions between them. Procedural justice and stressors act as key mechanisms in this system – the former as a stabilizer, and the latter as potential amplifiers or destabilizers of organizational processes.

In summary, the results clearly show that: 1. procedural justice is the dominant mechanism that determines the transformation of trust into effectiveness; 2. role overload has an adaptive and even positive effect in conditions of uncertainty; 3. role conflict remains a weak but negative factor, with limited influence in structured systems.

These findings emphasize that in VUCA–BANI conditions, management through stable and transparent procedures, combined with effective workload management, is more critical for organizational effectiveness than a focus on the distribution of results.

5. Conclusion

This study proposes an empirically validated integrative model of organizational effectiveness in the context of VUCA–BANI environments, which emphasizes the key role of socio-cognitive and structural mechanisms in organizations. The results clearly show that effectiveness is not a direct function of leadership, but emerges as the result of a complex system of interconnected processes, in which procedural justice plays a central stabilizing role.

More broadly, the results support the understanding of organizations as complex adaptive systems, in which effectiveness emerges as an “emergent” result of the interaction between trust, justice, team processes and role structures. In this context, successful management requires not so much control over results as the construction of stable, transparent and legitimate processes that reduce uncertainty and support coordination in the organization.

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