Adv. J. Manag. Humanit. Soc. Sci. (2026), Volume 2, Issue 1, 36-48

Advanced Journal of Management, Humanity and Social Science

Journal homepage: https://www.ajmhss.com/

DOI: https://doi.org/10.5281/zenodo.18087786

Presenting a Model of Factors Affecting Psychological Operations of Combat Forces

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Article info

Received: 20.11.2025

Accepted: 23.12.2025

Available Online: 29.12.2025

Checked for Plagiarism: Yes

Keywords:

Psychological operations design, Virtual space, Societal psychological factors, Model, DEMATEL method

ABSTRACT

The purpose of this study was to present a model of factors affecting psychological operations of combat forces. To this end, the researchers referred to experts from the Iranian armed forces and collected data through in-depth interviews. Data obtained from fifteen interviews and relevant documents were coded and analyzed. The research employed a mixed-methods approach (qualitative and quantitative), and the DEMATEL technique was used to identify the levels of the model of factors affecting psychological operations of combat forces and to examine causal relationships among the criteria. This technique scores the intensity of relationships, examines feedback along with their importance, and accepts non-transitive relationships. The grouping of codes revealed twenty-nine components across five levels, including psychological operations training, virtual space management, societal psychological factors, psychological operations design, and the use of psychological operations tools.

Conclusion: According to the findings, the proposed model can serve as a foundation for success in the psychological preparation of combat forces. In military environments, psychological operations are considered an integral part of mission planning and design and are regarded as highly important. Accordingly, the model of factors affecting psychological operations of combat forces was extracted and validated, the research framework was developed, and its goodness of fit was confirmed.

Introduction

Recent developments in information technology, along with the expansion of social networks and digital media, have transformed the traditional boundaries of psychological operations, making cyberspace the primary platform for many such operations (Taghipour & Jafari,2021).

In today's complex and rapidly changing world, psychological operations have gained a prominent position as one of the most influential tools in political, military, cultural, and social arenas. These operations, which aim to influence the attitudes, beliefs, and behaviors of target audiences through cognitive and communicative tools, have increasingly become a central concern of states and organizations (Nazari, 2017).

Numerous studies indicate that neglecting the cultural and mental context of target audiences can render psychological operations ineffective or even lead to counterproductive outcomes (Paddock, 2002).

Therefore, the design of effective psychological operations requires the use of frameworks and models based on a comprehensive analysis of local, media-related, and psychological conditions of the audience. In this regard, Shahbazi and Shahabi (2011), in their study titled "Examining the Role of New Media in the Enemy's Psychological Warfare," emphasized the necessity of developing media literacy and establishing cognitive barriers against psychological operations.

In the military domain, the concept of "morale" has always been regarded as a decisive factor in success. Leo Tolstoy refers to an X factor or the "spirit of the army," while Mengelsdorf defines it as vitality, confidence, and the voluntary willingness to undertake difficult missions (Elyasi,2003). The destruction of this morale is one of the core objectives of the enemy's psychological warfare.

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Given the importance of this issue, the founder of the Islamic Revolution, Imam Khomeini (RA), stated: "The weapon of propaganda is more powerful than the weapon of war." Moreover, the use of psychological operations dates back to ancient times, such as Gideon's battle against the Midianites, where victory was achieved without direct confrontation by creating an illusion regarding the number of forces.

A review of the research literature reveals that although valuable studies have been conducted on psychological operations within society, there remains a clear research gap in presenting a comprehensive model for preparing combat forces against psychological operations and for their effective utilization by the forces themselves. Accordingly, the main objective of the present study is to identify the influential factors and propose a conceptual model for psychological operations in the domain of combat forces. The main research question is: What are the factors affecting psychological operations of combat forces, and how are the structural relationships among these factors configured? Addressing this issue is considered a strategic necessity for enhancing the psychological resilience of forces and increasing the effectiveness of future operations.

Literature Review

Psychological operations, as an interdisciplinary field of study, have been examined from various perspectives. In a general classification, previous studies can be grouped into two main domains:

- ✓ **Content and media-oriented studies:** A large number of studies, such as those by Mirsamiei et al. (2015) and Paddock (2002), have focused on the analysis of propaganda content, media techniques, and the effects of messages on public opinion. These studies generally emphasize the role of tools and messages in psychological operations.
- ✓ **Audience and preparedness oriented studies:** Another group of studies, such as Elyasi (2003) and Rezaei (2019), have emphasized the psychological characteristics of the audience, morale-enhancing factors, and the necessity of training. However, few studies have systematically addressed the relational patterns among these factors within the context of combat forces, with the aim of presenting an operational model for force preparedness. For example, Nazari (2017) emphasized the need to adapt psychological operations to socio-cultural structures. Taghipour and Jafari (2021) also highlighted the irreplaceable role of cyberspace as a new platform for such operations. As noted, the present study seeks to integrate these perspectives, focus them specifically on the domain of combat forces, and, by employing a mixed-methods approach (qualitative quantitative), address the existing research gap by proposing an indigenous and practical model.

Methodology

This study is applied in terms of purpose and employs an exploratory mixed-methods design (qualitative → quantitative) in terms of data collection. The methodological process of the research was conducted in the following three phases:

Phase 1: Identification of Factors (Qualitative Method)

In this phase, using an interpretive approach and thematic analysis, influential factors were extracted from qualitative data. The statistical population consisted of experienced experts and commanders in the armed forces and the field of military psychology, who were selected through purposive sampling based on the criterion of theoretical saturation. Data were collected through 15 in-depth semi-structured interviews. Data analysis involved a three-stage coding process: open coding (extraction of 108 initial codes), axial coding (classification into 29 concepts), and selective coding (integration into 5 main themes). To ensure reliability and validity, techniques such as member checking, constant comparison with the literature, and the use of feedback from two external reviewers were employed.

Phase 2: Instrument Design and Distribution (Qualitative Quantitative Bridge)

The factors extracted in Phase One (29 components within five categories) were structured into a matrix-based questionnaire using the DEMATEL method. In this questionnaire, experts were asked to determine the degree of direct influence of each factor on the others on a scale ranging from zero to four.

Phase 3: Relationship Analysis (Quantitative DEMATEL Method)

In this phase, the DEMATEL technique was employed to identify the internal and structural relationships among the factors. This technique determines cause–effect relationships between factors through matrix calculations and classifies them into two groups: influencing (cause) factors and influenced (effect) factors. Data from 12 expert-completed questionnaires were analyzed, and the standard DEMATEL procedures including the calculation of the direct influence matrix, the indirect influence matrix, and the drawing of the causal relationship network were carried out. The results of the interview analyses ultimately led to the extraction of five main themes as the key factors influencing psychological operations of combat forces.

Category	Concept	Codes	No.
Psychological Operations	Psychological Operations Training	Enhancing the media and information literacy of forces Training in techniques for identifying fake news and rumors Holding practical workshops on countering psychological warfare Teaching persuasion psychology for commanders Instructing the principles of offensive and defensive psychological operations	1
	Cyberspace Management	Intelligent and proactive monitoring of relevant content Designing impactful campaigns on domestic and international social networks Managing information crises and controlling rumors Mastery of emerging communication platforms Producing engaging, persuasive, and indigenous content	2
	Societal Psychological Factors	Assessing and strengthening collective morale* Understanding the cultural and religious values of the target society Managing fear and hope in public opinion Analyzing the enemy's psychological strengths and weaknesses Enhancing the psychological resilience of forces under pressure Boosting morale and fostering hope within society Exposing the unfavorable outcomes of traitors by citing historical evidence Explaining the enemy's psychological warfare tactics by revealing distortions and censorship present in disseminated news Creating one or more hypothetical enemies in cyberspace and society	3
	Psychological Operations Design	Precise identification of target audiences (friendly / hostile / neutral) Formulation of strategies and operational objectives Accurate scheduling of message dissemination goals Inter-organizational coordination among intelligence, media, and operational bodies Designing multiple scenarios based on anticipated reactions	4
	Use of Psychological Operations Tools	Utilizing artificial intelligence platforms for big data analysis and content generation Using virtual and augmented reality to simulate conditions and enhance training Purposeful use of the capacities of cinema, music, and video games Employing modern communication methods such as micro-targeting	5

Research Findings: Qualitative Findings (Thematic Analysis)

The content analysis of 15 semi-structured interviews conducted with experts from the armed forces, based on the thematic analysis method, resulted in the identification of five main themes (categories), 29 concepts (components), and 108 initial codes. These themes were identified as the key factors influencing the design and implementation of psychological operations in combat forces. The thematic network of the extracted themes is presented in Table 1. Thematic Network of Factors Affecting Psychological Operations of Combat Forces.

Prioritization of Factors from Experts' Perspectives

To determine the level of importance and priority of these factors, the frequency of extraction of each theme from all interviews was calculated. The factor of psychological operations training, with an absolute frequency of 15 out of 15, was identified as the most fundamental pillar of success in the field of psychological operations of combat forces.

Table 2. Prioritization of Psychological Operations Factors Based on Expert Interviews

No.	Main Dimension	Total Experts Interviewed	Confirmed Frequency (Final Codes)	Percentage	Priority
1	Psychological Operations Training	15	15	100%	1
2	Cyberspace Management	15	13	86%	2
3	Societal Psychological Factors	15	11	73%	3
4	Psychological Operations Design	15	10	66%	4
5	Use of Psychological Operations Tools	15	8	53%	5

Presentation and Explanation of the Final Model
By integrating the qualitative findings (thematic network) and quantitative results (prioritization), a conceptual model of the factors affecting psychological operations of combat forces was developed. This model has the following characteristics:

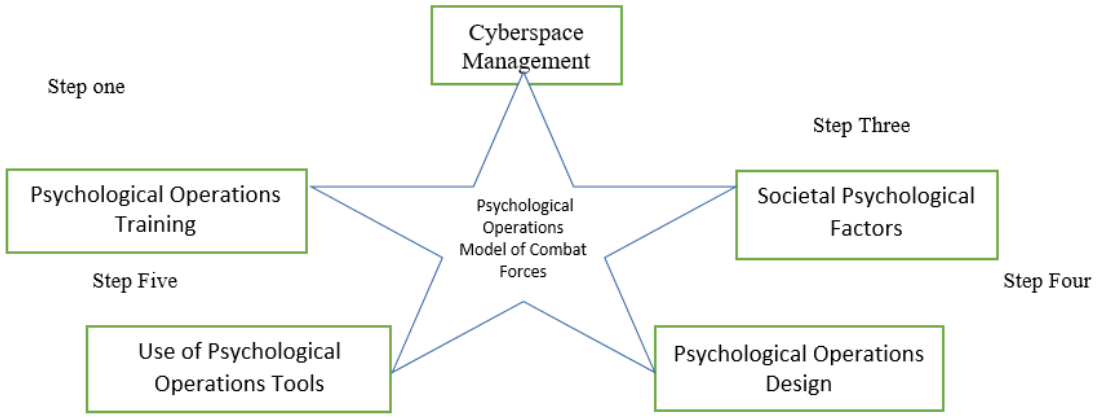


Figure 1. Model of Factors Affecting Psychological Operations of Combat Forces (Goodarzi, 2025)

Model Foundation (Causal Factor):
Psychological operations training is positioned at the foundation of the model as the primary pillar and essential prerequisite. This factor provides the necessary human capacity for the effective implementation of all subsequent stages of psychological operations.

Interactive Operational Cycle:
Three factors cyberspace management, psychological operations design, and use of psychological operations tools form an interactive operational cycle. This cycle indicates that the design of operations determines the selection of tools and cyberspace channels, while feedback received from cyberspace contributes to revising and improving subsequent operational designs.

Context and Ultimate Objective (Effect Factor):
Societal psychological factors constitute both the main context of influence and the ultimate objective of all psychological operations (whether aimed at strengthening friendly forces or weakening the enemy). This factor lies at the center of the cycle, and all operational activities are ultimately designed and executed to influence this context.

Causal Relationships and Feedback:
The bidirectional arrows among the components indicate dynamic relationships and continuous feedback. For example, changes in the societal psychological context necessitate revisions in operational design and cyberspace management mechanisms.

DEMATEL Technique (Decision Making Trial and Evaluation Laboratory)
The DEMATEL technique was first developed by Fontela and Gabus in 1972. As a multi-criteria decision-making method based on pairwise comparisons, it utilizes expert judgments to extract system factors and systematically structure them using graph theory principles. The outcome of this process is a hierarchical structure of system factors

accompanied by bidirectional causal relationships, with the strength of these relationships quantified through numerical scores.

The DEMATEL method is primarily used to analyze complex systems and to structure sequences of information. By scoring the intensity of relationships, examining feedback effects, and considering non-transitive relationships, this method enables a transparent representation of interactions within systems composed of numerous components. Such transparency allows experts to more accurately express their views regarding the direction and magnitude of influences among factors. The main objective of the DEMATEL technique is to identify the pattern of causal relationships among a set of criteria.

In research studies employing the DEMATEL method, the following steps are typically undertaken:

- ✓ Identification of relevant factors based on expert opinions and literature review.
- ✓ Design of the direct-relation matrix using pairwise comparisons.
- ✓ Normalization of the direct-relation matrix.
- ✓ Computation of the total-relation matrix (direct and indirect effects).
- ✓ Calculation of prominence (D + R) and relation (D − R) indices.
- ✓ Classification of factors into cause and effect groups.
- ✓ Visualization of causal relationships through a causal diagram.

Step 1: Using one of the idea generation methods among experts, such as brainstorming, brainwriting, Delphi technique, or conference, a list of existing and effective factors in the problem under study should be extracted from the perspective of the expert group.

Step 2: Based on the factors and criteria extracted in the previous step, a pairwise comparison survey matrix is created, where the rows and columns of this matrix are formed by the same criteria. Experts are asked to fill out the initial (empty) matrix by conducting pairwise comparisons to determine the effect of each criterion on the others. The assigned numbers should have the following meanings:

- ✓ Factor A has no effect on Factor B.
- ✓ Factor A has a low effect on Factor B.
- ✓ Factor A has a moderate effect on Factor B.
- ✓ Factor A has a relatively high effect on Factor B.
- ✓ Factor A has a very high effect on Factor B.

Step 3: The matrices resulting from Step Two are collected, and a decision regarding the existence or absence of a relationship between any two factors is made based on the majority vote of the experts.

Step 4: For each relationship confirmed in the previous step, the average score given by the experts to the direct influence of row factor A on column factor B is determined.

Step 5: Considering Steps Three and Four, matrix Z is formed, representing the intensity of influence governing the direct relationships within the system.

Step 6: The row sums of the entries in matrix Z are calculated. Matrix Z is then multiplied by the "reciprocal of the maximum value of the obtained row sums" to derive matrix X, which represents the relative intensity of influence governing the direct relationships within the system.

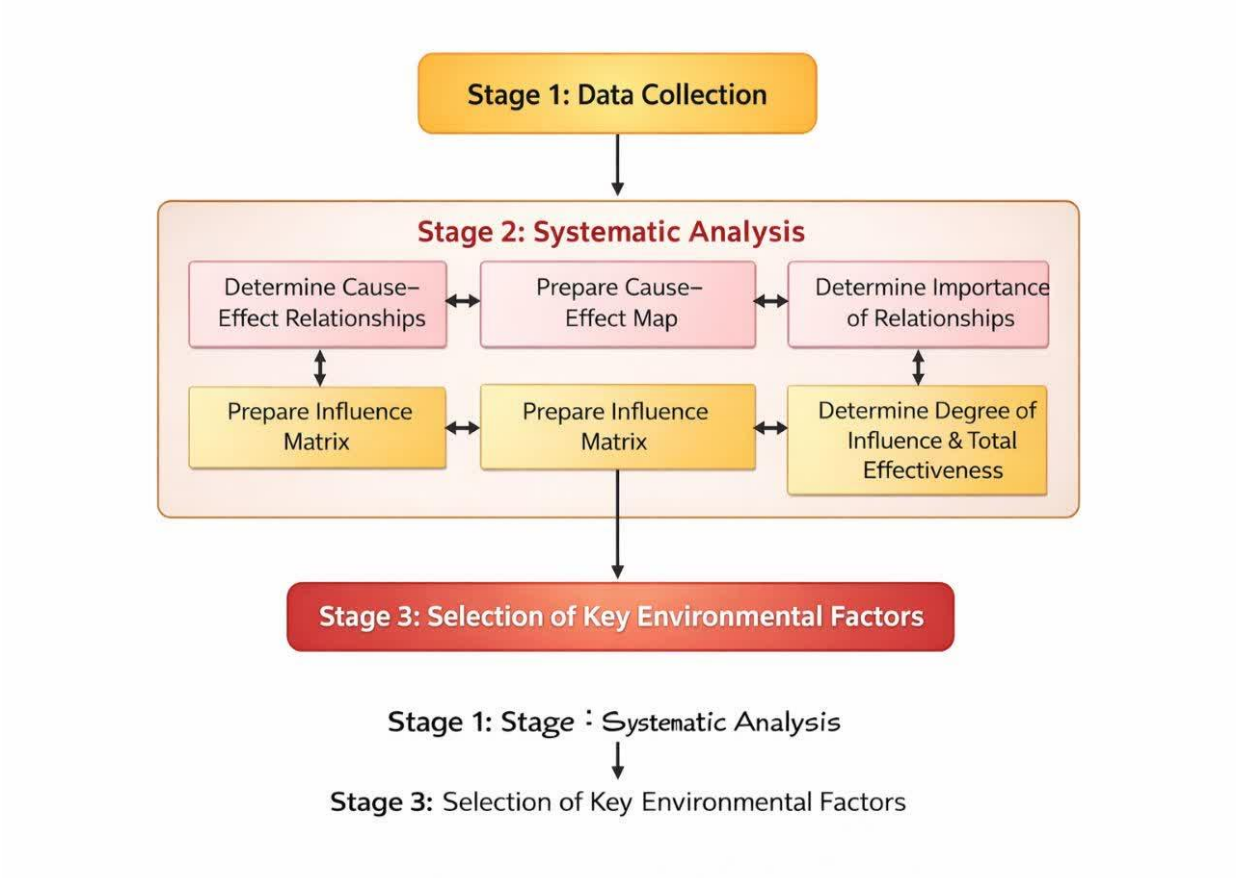
Step 7: Matrix T, representing the relative intensity of influence governing both direct and indirect relationships within the system, is formed. Based on graph theory principles, the total of direct and indirect influences of vertices on each other, considering all possible feedback loops, is calculated as the sum of the terms of an infinite geometric progression.

Step 8: The possible intensity of indirect effects among the existing elements is calculated.

Step 9: In matrix T, the sum of the row entries is D and the sum of the column entries is R. For each factor constituting the system, (D + R) indicates the importance (prominence) of that factor in the system, representing the total degree of influence given and received. The net effect (relation) of each factor on the other factors in the system is obtained from the difference (D - R).

Step 10: A Cartesian coordinate system is established where the horizontal axis is scaled by (D+R) and the vertical axis by (D-R). The position of each existing factor is determined by a point with coordinates (D+R, D-R) in this system. The diagram drawn in the previous steps is transferred to this coordinate system to obtain a simple graphical representation of the system's final structure. To guide the DEMATEL method, after gathering potential factors, expert opinions regarding these factors must be utilized. The sample size in most studies based on the DEMATEL method is 10 to 12 selected experts. It is crucial to note that in this process, the quality of expert judgment is the more important factor.

An important point to consider when collecting expert opinions is that scores should only be given for the direct influence relationship of row factor A on column factor B; the inverse relationship should not be considered. Also, the indirect influence of row factor A on column factor B through other existing factors should be disregarded.



The DEMATEL Method in a Structural Model

The Decision-Making Trial and Evaluation Laboratory (DEMATEL) method is one of the most widely used techniques for identifying and analyzing causal–effect relationships among criteria. To develop a structural model composed of causal and effect factors, the DEMATEL method is employed. To address the ambiguity inherent in human judgment, the linguistic variable "influence" is used along with several linguistic terms, including very high influence, high influence, low influence, very low influence, and no influence. These linguistic terms are represented by positive fuzzy numerical values. As demonstrated by the characteristics and outcomes of the DEMATEL technique, this method not only enables the ranking of components and determination of their relative importance but also identifies the degree to which each component influences or is influenced by other factors.

To identify the relationships among N criteria, an N× N matrix is constructed. This matrix is referred to as the direct-relation matrix and is denoted by X. Experts are then asked to assess the degree of influence of each criterion on the others using a scale ranging from 0 to 4 (Fazel et al.,2013).

Table 3. Scoring Scale Used in the DEMATEL Questionnaire

very high effect	high effect	low effect	very low effect	No effect
4	3	2	1	0

Modeling Relationships among Variables Using DEMATEL

To reflect the mutual interactions among the main criteria, the DEMATEL technique is applied. This method enables experts to express their judgments more accurately regarding both the direction and intensity of effects among factors. It should be noted that the matrix derived from the DEMATEL technique (i.e., the internal relation matrix) simultaneously illustrates causal relationships among factors as well as their influencing and influenced roles.

Based on the completed questionnaires and the collected matrices, and in accordance with the maximum rule, the relationships among approaches, criteria, and sub-criteria were identified. Subsequently, the median values of expert judgments for these relationships were calculated. Finally, a directed graph (digraph) representing the relationships among approaches, criteria, and sub-criteria was constructed based on weighted scores

ranging from 0 to 4. According to the influence levels identified by the experts, the corresponding matrices were derived. For this purpose, the scoring table was provided to the experts, and they were asked to evaluate the degree of influence of each factor on the others. Initially, twelve experts were requested to schematically illustrate the influence relationships among the factors based on their professional experience. The term experts refer to specialists who completed the DEMATEL questionnaire.

After identifying the research factors, expert opinions regarding the five identified items (research factors) were collected using the DEMATEL questionnaire. Following data collection, the arithmetic mean of expert judgments was calculated. Since twelve experts participated in the study, the values in each matrix cell were summed and divided by the number of experts (12). The resulting values represent the average expert judgment matrix.

Table 4. Average Expert Judgment Matrix

Use of Psychological Operations Tools	Psychological Operations Design	Societal Psychological Factors	Cyberspace Management	Psychological Operations Training	
3/88	3/91	3/92	3/95	•	Psychological Operations Training
3/31	3//42	3/45	•	3/51	Cyberspace Management
2/88	2/95	•	2/98	3/11	Societal Psychological Factors
2/74	•	2/81	2/89	2/93	Psychological Operations Design
•	2/67	2/79	2/83	2/89	Use of Psychological Operations Tools

The scoring matrix is completed based on the opinions of the experts who responded to the questionnaire

Dematel Technique Calculation Formula

$$X = \begin{bmatrix} 0 & \cdots & x_{1,n} \\ \vdots & \ddots & \vdots \\ x_{n,1} & \cdots & 0 \end{bmatrix}$$

$$k = \max\left\{ \max_i \sum_{j=1}^{n} x_{ij},\ \max_j \sum_{i=1}^{n} x_{ij} \right\}$$

$$N = \frac{1}{k} \cdot X$$

$$T = N \cdot (I - N)^{-1}$$

Calculation of the Direct-Relation Matrix (M)

After collecting the DEMATEL questionnaires, the first step is to calculate the arithmetic mean of the experts' judgments. When the opinions of several experts are used, the simple arithmetic mean of their evaluations is applied to form the direct-relation matrix (M).

At this stage, based on the relationships specified in the graph, the matrix M is constructed. For example, the relationship between training in psychological operations and management of cyberspace is equal to 3.95.

After collecting the DEMATEL questionnaires from 12 experts, the arithmetic mean of their responses was calculated, and the average direct-relation matrix was formed.

This matrix represents the intensity of the direct influence of each row factor on each column factor. The research criteria were labeled as follows.

symbols of research criteria

symbol	Criterion
Psychological Operations Training	C1
Cyberspace Management	C2
Societal Psychological Factors	C3
Psychological Operations Design	C4
Use of Psychological Operations Tools	C5

DEMATEL Technique Calculations and Results Analysis

Step 1: Construction of the Average Direct-Relation Matrix

The values of this matrix are obtained by calculating the arithmetic mean of the experts' opinions using a 0-4 scale.

Table 5. Average Direct-Relation Matrix of Experts' Opinions Based on the Research Criteria Symbols

C5	C4	C3	C2	C1	نسبت به
3/88	3/91	3/92	3/95	0	C1
3/31	3/42	3/45	0	3/51	C2
2/88	2/95	0	2/98	3/11	C3
2/74	0	2/81	2/89	2/93	C4
0	2/67	2/79	2/83	2/89	C5

Calculation of the α Value

According to the relevant formula, α is obtained as the inverse of the largest row-sum value. Then, the obtained value is multiplied by all elements of the matrix to derive matrix N (this process is referred to as normalization of matrix M).

To normalize the direct-relation matrix, the formula N=X / K (i.e., Equation 2 shown in the figure below) is used. To calculate K, the sums of all rows and columns are first computed. The largest resulting value is denoted by K, which is equal to 15.66 in the normalized direct-relation matrix table.

Step 2: Normalization of the Direct-Relation Matrix

Table 6. Normalized Direct-Relation Matrix

Sum of rows	Use of Psychological Operations Tools	Psychological Operations Design	Societal Psychological Factors	Cyberspace Management	Psychological Operations Training	
15/66	3/88	3/91	3/92	3/95	0	Psychological Operations Training
13/69	3/31	3/42	3/45	0	3/51	Cyberspace Management
11/92	2/88	2/95	0	2/98	3/11	Societal Psychological Factors
11/37	2/74	0	2/81	2/89	2/93	Psychological Operations Design
11/18	0	2/67	2/79	2/83	2/89	Use of Psychological Operations Tools
15/66						Highest number in row and column

Calculation of the Total-Relation Matrix

To calculate the total-relation matrix, the identity matrix I is first constructed. Then, the normalized matrix is subtracted from the identity matrix, and the resulting matrix is inverted. Finally, the normalized matrix is multiplied by the inverse matrix.

First, the sums of all rows and columns are calculated. The inverse of the largest row or column sum forms the value k. Based on the table, the largest

value is 15.66, and all values in the table are multiplied by the inverse of this number in order to normalize the matrix. (This process is referred to as normalization of matrix M.)

The normalization coefficient is equal to 1/k, that is: 1 / 15.66

0/06385696

The following matrix is called the scale-free direct relationship influence matrix, matrix D

C5	C4	C3	C2	C1	نسبت به
0/247765006	0/249680715	0/250319285	0/252234994	0	C1
0/211366539	0/218390805	0/220306513	0	0/224137931	C2
0/183908046	0/188378033	0	0/190293742	0/198595147	C3
0/174968072	0	0/179438059	0/184546616	0/187100894	C4
0	0/170498084	0/17816092	0/180715198	0/184546616	C5

D-1 matrix according to the research criteria symbol

C5	C4	C3	C2	C1	نسبت به
-0/247765006	-0/249680715	-0/250319285	-0/252234994	1	C1
-0/211366539	-0/218390805	-0/220306513	1	-0/224137931	C2
-0/183908046	-0/188378033	1	-0/190293742	-0/198595147	C3
-0/174968072	1	-0/179438059	-0/184546616	-0/187100894	C4
1	-0/170498084	-0/17816092	-0/180715198	-0/184546616	C5

The following matrix is called the inverse of the I-M matrix.

C5	C4	C3	C2	C1	نسبت به
1/076678221	1/086149501	1/087645345	1/070612497	1/857882821	C1
0/96288918	0/975142506	0/977397879	1/780419825	0/953314065	C2
0/858889742	0/86864018	1/71096528	0/856191592	0/852722962	C3
0/824822215	1/682211757	0/835161022	0/824673004	0/817660899	C4
1/666357224	0/818239901	0/824572421	0/812471883	0/806475851	C5

At this stage, the direct (effect) relationship matrices are constructed based on the identified relationships and the mean scores obtained in the previous steps, and the normalized direct-effect matrix at the level of approaches is calculated.

The following matrix is called the total relationship matrix or the sum of direct effects matrix

C5	C4	C3	C2	C1	نسبت به
1/076678221	1/086149501	1/087645345	1/070612497	0/857882821	C1
0/96288918	0/975142506	0/977397879	0/780419825	0/953314065	C2
0/858889742	0/86864018	0/71096528	0/856191592	0/852722962	C3
0/824822215	0/682211757	0/835161022	0/824673004	0/817660899	C4
0/666357224	0/818239901	0/824572421	0/812471883	0/806475851	C5

The total-relation matrices (T) indicate the relative intensity of both direct and indirect relationships among approaches, criteria, and sub-criteria. The table presents the total-relation matrix for the approaches.

The following matrix is called an indirect matrix.

C5	C4	C3	C2	C1	نسبت به
0/828913215	0/836468786	0/837326061	0/818377503	0/857882821	C1
0/751522641	0/756751702	0/757091366	0/780419825	0/729176134	C2
0/674981696	0/680262147	0/71096528	0/66589785	0/654127815	C3
0/649854143	0/682211757	0/655722963	0/640126388	0/630560005	C4
0/666357224	0/647741816	0/646411501	0/631756685	0/621929235	C5

Network Relationship Map (NRM) Visualization

To determine the Network Relationship Map (NRM), the threshold intensity must first be calculated. This method allows minor relationships to be disregarded and a meaningful network of relationships to be drawn. Only the relationships whose values in matrix T are greater than the threshold value are displayed in the NRM.

To calculate the threshold value of relationships, it is sufficient to compute the average of the values in matrix T. After the threshold intensity is determined, all values in matrix T that are smaller than the threshold are set to zero; that is, the corresponding causal relationships are not considered.

Table: DEMATEL Index Analysis

تجزیه و تحلیل شاخص های دیمتل				
Di-Ri	Di+Ri	Ri	Di	عوامل
0/890911787	9/467024984	4/288056598	5/178968386	C1
0/304794656	8/993532255	4/3443688	4/649163455	C2
-0/28833219	8/583151703	4/435741947	4/147409756	C3
-0/44585495	8/414912741	4/430383845	3/984528896	C4
-0/4615193	8/317753861	4/389636582	3/928117279	C5

The output of the DEMATEL method consists of four indices: R, D, R + D, and R − D.

The R index represents the row sum of the values and indicates the influence of a factor on other factors, reflecting the degree of influence of a variable. Based on the DEMATEL index analysis, psychological operations training, cyberspace management, societal psychological aspects, psychological operations design, and the use of psychological operations tools influence one another, indicating their level of impact as influencing variables.

In the table, the D index, which is the column sum of the values, represents the degree to which a criterion is influenced by other criteria in the model. Accordingly, psychological operations training has the highest level of influence, followed by cyberspace management.

The horizontal vector (D + R) indicates the overall prominence of each variable and the extent to which the factor both influences and is influenced within the system. In other words, the larger the value of D + R, the greater the interaction of that factor with other system factors. Based on this, psychological operations training and cyberspace management show the highest levels of interaction with the other Threshold for obtaining meaningful relationships

criteria under study. The R + D horizontal axis represents the importance of the variables and is interpreted as their level of prominence or centrality. The vertical vector (D − R) represents whether a variable is influential or influenced, as well as the strength of its causal power. In general, if D − R is positive, the variable is considered a causal factor, whereas if it is negative, the variable is considered an effect (resultant) factor. Based on the DEMATEL index analysis, the causal group includes psychological operations training and cyberspace management, while the effect group includes societal psychological aspects, psychological operations design, and the use of psychological operations tools.

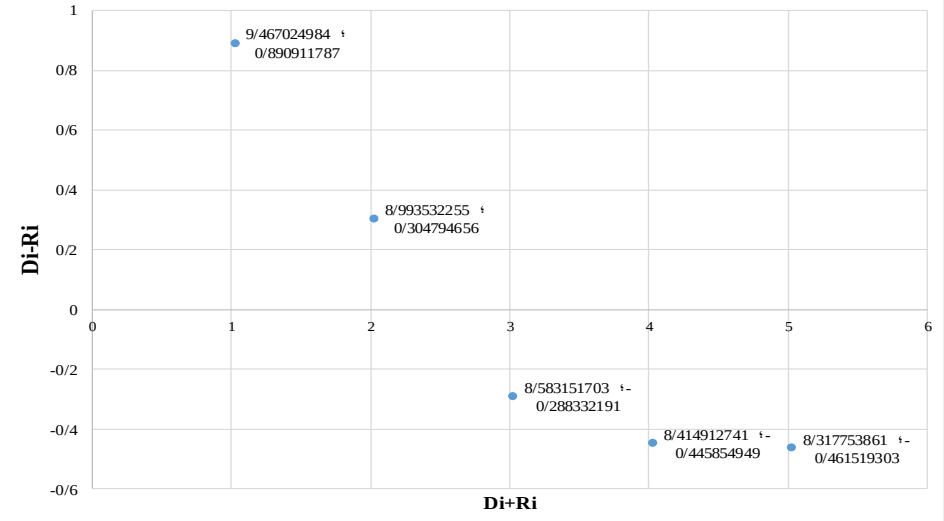
The vertical axis (R − D) classifies factors into two groups: causal and effect. Factors with positive values belong to the causal group, whereas those with negative values belong to the effect group. Moreover, if this value is zero for a given factor, it can be considered both causal and effect simultaneously (Hung, 2011).

Matrix of meaningful relationships between research factors based on threshold

C5	C4	C3	C2	C1	نسبت به
1	1	1	1	0	C1
1	1	1	0	1	C2
0	0	0	0	0	C3
0	0	0	0	0	C4
0	0	0	0	0	C5

Based on the pattern of relationships, a causal diagram can be drawn according to the table.
Finally, a Cartesian coordinate system was constructed in which the horizontal axis represents D + R values and the vertical axis represents D − R values. The position of each factor was determined by a point with coordinates (D + R, D − R) in this system. In this way, a graphical representation was obtained.

Figure1. Cartesian Coordinate Diagram of the DEMATEL Technique



A summary of the graphical representation is presented in the diagram.
According to the figure, psychological operations training and cyberspace management, which are positioned above the horizontal axis, have a positive net effect intensity and are therefore categorized as causal, driving, or influencing indicators. In contrast, the indicators located below the horizontal axis exhibit a negative net effect intensity and are clustered as dependent indicators. Accordingly, societal psychological factors, psychological operations design, and the use of psychological operations tools are positioned below the horizontal axis, indicating a higher degree of susceptibility to influence.

Final Conclusion

Based on the DEMATEL analysis, psychological operations training was identified as the most critical and influential factor. This finding indicates that, in order to affect the entire psychological operations system in cyberspace, initial strategic investment and focus should be directed toward the development, quality improvement, and expansion of specialized training in this domain. Cyberspace management also emerged as another important causal factor that complements this strategy. The higher the position of an indicator in the diagram, the greater its degree of influence; conversely, the lower its position, the greater its degree of being influenced. Moreover, as indicators move toward the right side of the diagram, they gain greater importance, because the sum of their influencing and influenced effects increases. In other words, an indicator that has greater interaction with other indicators possesses higher importance. Therefore, psychological operations training and cyberspace management are of greater importance compared to the other indicators. Based on the results, it was determined that the most influential components are psychological operations training and cyberspace management.
remaining three factors (societal psychological factors, psychological operations design, and psychological operations tools), although important, primarily play the role of outcome variables in this model and are influenced by the two main causal factors.

Discussion and Conclusion

The primary objective of this study was to develop a structured model of the factors influencing the effectiveness of psychological operations among combat forces, with a particular emphasis on

cyberspace. To achieve this objective, a mixed qualitative–quantitative approach was employed. In the qualitative phase, five key factors were identified through in-depth interviews with experienced experts from the armed forces and the application of thematic analysis. In the quantitative phase, the DEMATEL technique was applied to uncover the complex and causal relationships among these factors.

Overview of Key Findings

The results obtained from the implementation of the DEMATEL technique clearly revealed the level of importance and the role of each of the five factors within the psychological operations system of combat forces. Based on the calculated quantitative indices (D + R and D − R), the findings are summarized as follows:

Psychological operations training, with the highest value of the importance index and the largest positive value of the net relationship index, was identified as the most important and influential causal factor in the model. This result emphasizes that educational content, instructor quality, and continuous updating of training relative to technologies and tools play a more fundamental role in the success of psychological operations.

Cyberspace management, with a high importance index and a positive net relationship value, ranked second as the second major causal factor in the system. This finding suggests that the organization, monitoring, and active governance of cyberspace constitute a prerequisite and enabling platform for the effective implementation of other components.

Societal psychological factors, psychological operations design, and the use of psychological operations tools were classified as effect factors due to their negative net relationship indices. This indicates that although these factors are vital, they are largely influenced by the two aforementioned causal factors (training and management) and function primarily as outputs or results of the system.

Interpretation and Explanation of Results

The causal pattern obtained supports a strategic logic: the efficiency of each tool and the effectiveness of each design depend on managers and personnel who possess specialized knowledge and skills, institutionalized through effective training. Additionally, this trained workforce requires operation within a cohesive and well-managed structure (cyberspace management) to ensure that efforts are aligned and focused. Only under these conditions can accurate psychological analysis of the audience be achieved, enabling intelligent operational planning and optimal selection and use of tools. Neglecting this strategic precedence, which has been quantitatively demonstrated in this study, may lead to resource waste and a significant reduction in the effectiveness of psychological operations.

The proposed model, with an emphasis on training as the central axis, aligns with modern perspectives in human resource management and the knowledge-based nature of contemporary warfare. Moreover, the prominent role of cyberspace management as a causal factor highlights the importance of a systemic approach and unified command in the turbulent and expansive field of virtual psychological operations.

In summary, using a mixed-methods approach, this study successfully identified five key factors and their causal structural relationships within combat forces' psychological operations. The final model clearly demonstrates that the two factors, training and strategic cyberspace management, serve as fundamental causes whose effects are exerted through an operational cycle on the societal psychological landscape. These findings provide a scientific framework for prioritizing investments and strategic planning in this critical domain.

Research Limitations

The study population consisted of armed forces experts who, despite their extensive experience and expertise, may limit the generalizability of the results to other organizations or cultural contexts.

Although the DEMATEL technique is capable of illustrating causal relationships, these relationships were measured at a single point in time. The long-term dynamics of these relationships could be a subject of future research.

Suggestions for Future Research

- ✓ **Model validation in other forces:** Testing the model in law enforcement, intelligence, or international contexts could enhance its generalizability.
- ✓ **Dynamic model development:** Using dynamic methods such as system dynamics to simulate the behavior of these factors over time and under different scenarios.
- ✓ **Defining objective indicators for factors:** For actionable measurement of qualitative factors such as societal psychology, further research should aim to define and quantify objective indices.

Practical Recommendations

Based on the study findings, the following practical measures are proposed:

- ✓ **Revision of training curricula:** With a focus on the first factor (training), psychological operations curricula should be updated to emphasize cyberspace analysis, social network psychology, and modern content production methods.
- ✓ **Establishment of integrated management mechanisms:** To strengthen the second causal factor, it is recommended to create a unified

command or headquarters for coordinated and strategic management of all combat forces' psychological operations in cyberspace.

- ✓ **Formulation of a strategic document:** Based on the five-factor model and identified causal relationships, a strategic document for psychological operations in cyberspace should be developed, clearly defining duties, responsibilities, and performance indicators for each component.
- ✓ **Intelligent resource allocation:** Considering the causal priority of factors, allocation of financial, human, and technological resources should prioritize investment in specialized training, followed by strengthening managerial structures.

Acknowledgements
We sincerely thank all commanders, professors, and respected experts of the Islamic Republic of Iran Armed Forces who generously shared their knowledge and experience through interviews and questionnaire completion. Their honest cooperation formed the foundation for the scientific rigor of this research.

Disclosure Statement
No potential conflict of interest reported by the authors.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions
All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

References

[1] Elyasi, M. H. (۲۰۰۳). Farāyand-e tazʿif-e ruhiyye-ye artesh-e ʿErāq tavassot-e Eylāt-e Motaḥede [The process of demoralizing the Iraqi army by the United States]. Defense Policy Journal, (42), 11-31.

[2] Fazel, M., et al. (۲۰۱۳). Erāye-ye yek model-e tashkhis-e chand-maʿyāre bā estefāde az ravesh-e fāzi DEMATEL [Providing a multi-criteria decision-making model using fuzzy DEMATEL]. Industrial Management Quarterly.

[3] Fontela, E., & Gabus, A. (1976). The DEMATEL observer. Battelle Geneva Research Center.

[4] Gabus, A., & Fontela, E. (1972). World problems, an invitation to further thought within the framework of DEMATEL. Battelle Geneva Research Center.

[5] Gorji, E., & Barkhordari, S. (۲۰۰۹). Mabāni-ye ravesh-hā-ye taḥqiq dar ʿolum-e ejtemāʿi [Fundamentals of research methods in social sciences]. Sales.

[6] Hejab, M. M. (۲۰۰۸). Jang-e ravāni (Al-Ḥarb al-Nafsiya) [Psychological warfare] (S. Yarmand, Trans.; 2nd ed.). Shahid Sepahbod Sayyad Shirazi Training and Research Center.

[7] Lee, H.-S., Tzeng, G.-H., Yeih, W., Wang, Y.-J., & Yang, S.-C. (2013). A modified DEMATEL technique for the selection of green suppliers. International Journal of Information and Management Sciences, 24(3), 245-266.

[8] Littlejohn, S. W., & Foss, K. A. (۲۰۱۱). Nazariye-hā-ye ertebāṭ [Theories of communication] (M. Zare, Trans.). SAMT.

[9] Mirsamiei, S. M., Fazeli, H., & Mostafavi, M. (۲۰۱۵). Jang-e ravāni va naqsh-e savād-e resāneh-ī dar imūn-sāzi-ye jāmeʿe [Psychological warfare and the role of media literacy in societal immunization]. Quarterly Journal of Social Studies and Research in Iran, 4(1), 75-98.

[10] Nazari, M. (۲۰۱۷). Ravān-shenāsi-ye jang-e narm: Mabāni, abzārhā va rāhbordhā [Psychology of soft warfare: Principles, tools, and strategies]. Soroush.

[11] Paddock, A. H. Jr. (2002). Amaliyāt-e ravāni [Psychological operations] (M. X, Trans.). Publisher. (Original work published 2002).

[12] Rezaei, M. R. (۲۰۱۹). Barresi-ye naqsh-e ʿamaliyāt-e ravāni dar amniyat-e melli [Examining the role of psychological operations in national security]. Quarterly Journal of Strategic Studies, 21(1), 85-102.

[13] Shahbazi, M., & Shahabi, A. (۲۰۱۱). Kārbord-e shive-hā-ye tabligh dar ejrā-ye ʿamaliyāt-e ravāni [Application of propaganda methods in the implementation of psychological operations]. Quarterly Journal of Military Science and Technology, 7(2), 45-68.

[14] Sorin, W. J., & Tankard, J. W. (۲۰۰۲). Nazariye-hā-ye ertebāṭ [Theories of communication] (A. Dehghan, Trans.). University of Tehran Press.

[15] Taghipour, S., & Jafari, A. A. (۲۰۲۱). ʿAvāmel-e moʾasser bar eftekār-bakhshi-ye ʿamaliyāt-e ravāni dar fazā-ye majāzi [Factors affecting the effectiveness of psychological operations in cyberspace]. Quarterly Journal of Modern Social Security Research, 10(3), 55-74.

[16] Toussali, G. A. (۱۹۹۰). Jāmeʿe-shenāsi: Mafāhim va kārbordhā [Sociology: Concepts and applications]. SAMT.

[17] Wu, W.-W., & Lee, Y.-T. (2007). Developing global managers' competencies using the fuzzy DEMATEL method. Expert Systems with Applications, 32(2), 499-507.