Seeding Success: Generating Valid and Realistic PMESII Start Values for Serious Wargames and Simulators

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Abstract

PMESII (Politics, Military, Economic, Social, Information, and Infrastructure) framework is widely accepted as parameters to judge and measure the condition of a country.
The success of each serious wargame and simulator depends, among other things, on the right starting conditions. Especially in the field of serious military wargames, it can be difficult to obtain realistic data about the condition of a played country. Therefore, data from free available sources and the weighting and processing of this data could be immensely helpful to generate realistic starting values.
Using open-source databases and the method of cross-impact weighting will increase the reliability of generating PMESII start conditions for wargames and simulators.

Keywords: PMESII, wargaming, simulation, cross-impact analysis, open-source

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1. Introduction

1.1 Background

In military training and simulation, creating realistic scenarios is fundamental for effective preparation and strategic readiness. Such realism allows for accurate assessment and decision-making exercises that mirror potential real-world conditions, preparing military personnel for complex operational environments.

1.2 Purpose of the Paper

This paper presents a novel approach for deriving realistic PMESII (Political, Military, Economic, Social, Information, Infrastructure) starting values using open-source data. By leveraging accessible and reliable public databases, this method aims to provide a robust alternative to traditional sources like intelligence reports or subjective expert opinions, which may be limited, classified, or subject to bias.

1.3 Paper Structure

The paper is organized into seven sections. Following the Introduction, the Motivation section addresses existing challenges in PMESII data acquisition. The PMESII Framework section explains each component's role in strategic simulations, while Methodology describes the data sources and the PMESII-Generator. Verification and Validation outlines the expert survey and results analysis. The Discussion explores the findings' implications and limitations, and the Conclusion summarizes key insights and proposes areas for future research.

2. Motivation

2.1 Problem Statement

Traditional sources for PMESII values, such as intelligence data or expert assessments, are often inaccessible due to

confidentiality restrictions or exhibit biases based on subjective interpretation. This data gap limits the ability to create unbiased and reproducible initial conditions for simulations.

2.1 Goal

The goal of this study is to develop a reliable, replicable process for generating realistic PMESII values based on openly available data[1]. This approach seeks to improve the accessibility and objectivity of PMESII data for military simulations, ensuring that generated values are both practical and broadly applicable.

3. PMESII Framework

3.1 Definition and Components

The PMESII framework encompasses six components—Political, Military, Economic, Social, Information, and Infrastructure—that collectively assess a nation's stability and capability across various domains[2]. Each component provides essential insights into the factors influencing national and regional security.

3.2 Application in Simulations and Wargames

In wargaming and military simulation, PMESII values serve as both starting criteria and indicators of progress, allowing for dynamic adjustments based on simulated events. By accurately reflecting each PMESII component, simulations can more effectively measure changes in strategic conditions, assess outcomes, and support training objectives.

4. Methodology

4.1 Data Sources

This study utilizes several publicly accessible databases to populate PMESII components:

- **World Bank**[3]: Provides socioeconomic and demographic data relevant to Economic and Social components.
- **World Population Review**[4]: Offers population and health metrics that enhance the Social dimension.
- **Heritage Foundation**[5]: Supplies political and economic freedom indices relevant to Political and Economic components.
- **Global Firepower**[6]: Delivers military strength data that informs the Military component.
- **SIPRI**[7]: Provides defense expenditure and arms data, adding depth to Military and Infrastructure dimensions.

4.2 PMESII Generator

The PMESII-Generator aggregates this information, standardizes it, and assigns preliminary values to each PMESII dimension. To further enhance accuracy, we applied a cross-impact weighting technique[8], which adjusts the relative importance of each component based on interdependencies identified by subject matter experts (SMEs) (**Figure** 1**: PMESII Generator Example for "Economy"Figure** 1). The resulting model thus balances empirical data with expert-driven adjustments, allowing for nuanced initial conditions that are well-suited for serious wargame applications.

x		Economy						
	#	Condition	Yes	?	No	Value yes	Value ?	Value No
PMESII starting Value (optimized) / Starting Value	1	Is the country part of a significant free-treating economic organization?	x			2	1	0
	2	Is the country considered developed?	x			2	1	0
	3	Is the country member of the G20?	x			1	0.5	0
	4	If YES, is the country member of the G7?	x			1	0.5	0
	5	Has the country a stable currency? (normal avarage inflationrate <3% per year)	x			1	0.5	0
P	6	Are sanctions in place?			x	-1	0	1
M	7	Is the budget for the military over 2% of the GDP	x			0	0.5	1
S	8	Economic benefits are distributed equally for the society?		x		2	1	0
I1	9	Is the media landscape controled by government?			x	1	0.5	0
I2	10	Does industry have a significant share in the economy?	x			1	0.5	0
	11			x		0	0	0
	12			x		0	0	0
	13			x		0	0	0
	14			x		0	0	0
	15			x		0	0	0
		PMESII starting Value:		13				
		PMESII starting Value (optimized):		11.11				

Figure 1**: PMESII Generator Example for "Economy"**

5. Verification and Validation

5.1 Verification Approach

To ensure the accuracy and relevance of the generated PMESII values, a verification process (survey) was conducted involving subject matter experts (SMEs) in military strategy and simulation. Participants included 58 military and civilian experts, ranging from rank OF-5 to OF-8, selected from the NATO Defense College (NDC) Senior Course and the WIN 2024 conference.

5.2 Survey Method

Experts were asked to complete a survey consisting of two primary tasks: assigning PMESII scores on a scale from 0 to 9, indicating the condition of each factor (**Figure** 2), and completing a cross-impact matrix to rate interdependencies among PMESII components. This cross-impact matrix allowed for a quantitative assessment of the dependencies that enhance simulation realism (**Figure** 3).

Political	Military	Economic	Social	Information	Infrastruct.

Figure 2**: Survey Question 1**

	P	M	E	S	I	I
P						
M						
E						
S						
I						
I						

Figure 3: Survey Question 2

5.3 Results

Detailed metrics, such as standard deviation and median values, indicated consistent reliability across the selected data. The excamples for “Military” are shown in Figure 4 and **Figure** 5.

M	
Mean	3.224138
Standard Error	0.18248
Median	3
Mode	4
Standard Deviation	1.389725
Sample Variance	1.931337
Kurtosis	-0.95002
Skewness	0.029269
Range	5
Minimum	1
Maximum	6
Sum	187
Count	58
Confidence Level(95.0%)	0.36541

Figure 4: Statistical Analysis. Example for "Military"

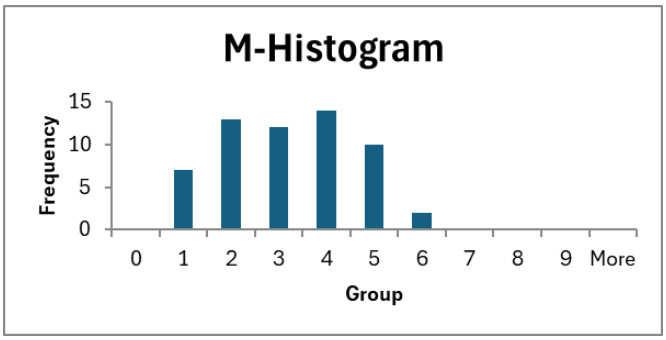

Figure 5**: Histogram. Example for "Military"**

The verification process yielded valuable data, highlighting both the accuracy and areas for improvement in the PMESII-Generator's output (Figure 6). Statistical analysis of the expert scores (Figure 7) revealed a high degree of alignment between the generated PMESII values and the expert assessments, particularly for the Political, Economic, and Infrastructure dimensions, which achieved mean scores within a 5% variance from the SME evaluations.

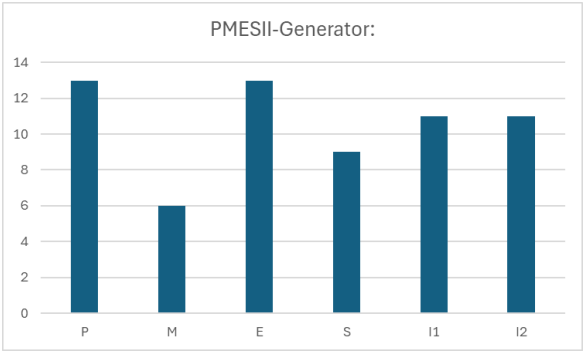

Figure 6: PMESII Generated Values

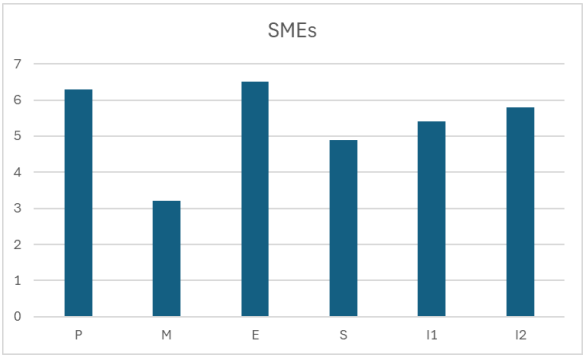

Figure 7: SME Generated Values

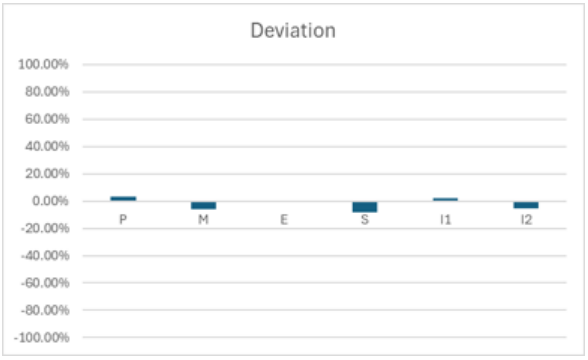

Figure 8: Deviation

Although, slight discrepancies were observed in the Social and Military dimensions, suggesting the need for additional data sources or refined weighting adjustments to enhance precision. In theses categories the mean scores are within a 8% variance from the SME evaluation (Figure 8).

Overall, the results confirm that the PMESII-Generator provides a dependable baseline for wargame simulations, accurately reflecting expert evaluations in most cases.

6. Discussion

6.1 Interpretation of Results

Nevertheless, slight discrepancies were observed in the Social and Military dimensions, suggesting the need for additional data sources or refined weighting adjustments to enhance precision. Overall, the results confirm that the PMESII-Generator provides a dependable baseline for wargame simulations, accurately reflecting expert evaluations in most cases.

6.2 Limitations of the Approach

Despite its strengths, the PMESII-Generator has certain limitations, such as the variable timeliness of open-source data and occasional gaps in coverage for specific regions or sectors. These limitations suggest the need for continuous data updates and refinements to improve regional accuracy.

6.3 Comparison to Alternative Approaches

Compared to traditional methods that rely on classified intelligence or subjective expert input, the PMESII-Generator offers a transparent and scalable alternative. However, while it offers strong baseline accuracy, specific high-stakes simulations may benefit from hybrid approaches combining open-source and classified data.

7. Conclusion

7.1 Summary

This paper presents a validated approach to generating PMESII starting values through open-source data, effectively addressing accessibility and accuracy limitations in military simulation scenarios. The PMESII-Generator offers a reliable alternative for setting baseline conditions across diverse wargame applications.

7.2 Outlook

Future research should explore expanding the PMESII-Generator's database integration, improving regional specificity, and testing the model in varied simulation contexts. Additionally, adaptations to specific military applications, such as humanitarian or peacekeeping simulations, could further broaden its utility.

8. References

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