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Hub-Centric Warfare and Networked Regional Orders in the Middle East

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Abstract

What happens to warfare when the international order stops being a hierarchy and starts behaving like a network? This article takes that question to the Middle East, a region where chronic conflict and external intervention have produced a scale-free, hub-dominated structure. Using abductive reasoning, the study moves back and forth between network theory and empirical data, computing degree, closeness, and betweenness centrality to map how a handful of actors like Saudi Arabia, Türkiye, and the Islamic Republic of Iran have become the network's gravitational centers. The findings show that warfare is no longer primarily about large-scale, time-limited campaigns; instead, conflicts increasingly revolve around these hubs, whose diplomatic, military, and geographic leverage shapes when and how wars emerge, escalate, and continue. Historical analysis traces the deeper evolution of order, while the centrality metrics and sensitivity testing reveal a structural shift from extensive to intensive power, with hubs serving as both prime targets and indispensable peacemakers. By treating the Middle East as a networked complex adaptive system, the article offers a fresh lens for critical security studies and a sharper picture of how global order and modern warfare now feed into each other.

Keywords: Networked warfare, complex-chaotic international system, network order structure, the Middle East regional network, regional key hubs.

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Introduction

The evolving nature of warfare in the 21st century presents profound challenges for International Relations (IR) scholarship, particularly in understanding the interplay between global order and conflict dynamics. As General Peter Pace emphasized in the 2006 Quadrennial Defense Review, predicting the security landscape of 2025 is fraught with uncertainty, necessitating agile and adaptable capabilities to address emerging complexities (Department of Defense, 2006, p. A-4). Since the early 2000s, warfare has undergone significant transformation, driven by the increasing complexity and chaos in interactions among international actors. This shift, often described as the transition from fourth- to fifth-generation warfare, has redefined conflict, rendering traditional definitions of war obsolete. The 2023 Gaza war, the Houthi movement's confrontations in the Red Sea, and the Russo-Ukrainian war exemplify how non-state and/or weaker actors challenge the conventional international system, highlighting a fundamental transformation in the nature of warfare. These developments underscore the limitations of hierarchical frameworks, as modern conflicts are increasingly shaped by networked, decentralized dynamics and rapid technological advancements, raising both strategic and ethical concerns (Aradau, 2010; Chandler, 2014).

While traditional studies focus on how wars influence international and regional orders (Adler-Nissen & Zarakol, 2021; Gilpin, 1988; Ikenberry, 2001; Schuman, 1953; Wallerstein, 2004), the reverse—how orders shape the nature of conflicts—receives less attention. This study addresses this gap by examining how the physical structure of the international order, conceptualized as topology in network theory, drives changes in contemporary warfare. IR scholarship has extensively explored the transformative factors of modern warfare, yet network and complexity-chaos theories provide a distinctive lens for analysis that effectively captures the decentralized, hub-based character of contemporary conflicts (Czerwinski, 2003). Yet this oversight persists even within these newer approaches: while Gunitsky (2013) uses network theory to explain regime change and Kanat (2021) applies it to alliances, neither has systematically traced how the topological features of order itself shape conflict patterns. Complexity IR scholarship emphasizes nonlinearity but rarely operationalizes it in structural terms to explain warfare.

Today's international relations are so deeply enmeshed in connectivity and technological change that classical IR theories increasingly struggle to make sense of them. Network theory (Newman, 2010) and complexity-chaos theory (Acharya, 2017; Ferreira et al., 2014; Jervis, 1997; Tomé & Açıkalın, 2019) offer a more fitting alternative. The international system, viewed this way, behaves like a complex adaptive system: it is shaped by nonlinear interactions, feedback loops, emergence, and self-organization, and it is fundamentally irreducible to the actions of any single state (Carmichael et al., 2019; Gunitsky, 2013). Within this networked order, power is not distributed uniformly but concentrates in hubs—nodes or actors with high centrality that structure the flow of communication, resources, and influence. Centrality itself can be measured in three ways: degree (direct connections), closeness (short paths to all others), and betweenness (lying on critical paths whose removal would fragment the network). Hubs therefore wield disproportionate networked power, capable of both stabilizing regional clusters and triggering cascading failures that unravel the system. Warfare, as an inherent feature of this system, becomes hub-centric: decentralized at the tactical level yet structurally concentrated around these central nodes. Accordingly, the central research question is: how do transformations in the international order's structure influence the patterns of modern conflicts?

I argue that the international system has moved from a hierarchical configuration to something more like a dissipative network (a far-from-equilibrium structure that maintains order through continuous energy and information flows), where regional orders gain primacy and power concentrates in key hubs. As a result, warfare becomes hub-centric: conflicts are increasingly shaped by struggles to control, defend, or disrupt these central nodes that can either stabilize or destabilize entire regional networks. To develop this argument, the study employs an abductive mixed-methods approach (Timmermans & Tavory, 2012), moving iteratively between deductive expectations drawn from network and complexity theories and inductive patterns observed in recent Middle Eastern conflicts. The empirical foundation combines network analysis of conflict-event data with comparative case studies from the Middle East regional network, allowing the research to capture both broad structural patterns and the causal mechanisms that operate within specific hubs.

The article first builds a network model of hub-centric power, then puts it to work on the Middle East by measuring centrality and stress testing the results. The findings show how hubs increasingly drive conflict, and the conclusion draws out what this means for both theory and policy. The concluding section summarizes the argument and outlines avenues for further research.

1. Theoretical Foundations

Emergence is a hallmark of complex adaptive systems: macro-level patterns that arise from countless agent interactions without any single actor being in control. Due to emergence, a complex system becomes more than the mere sum of its parts (Scartozzi, 2018, p. 117). The international system, as a complex adaptive system, has been affected by emergent phenomena which recall the butterfly effect. Major disruptions—from the Opium Wars, triggered by a 19th-century trade imbalance, to the First Gulf War, fueled by Iraq's postwar debt, to the cascading instability unleashed by 9/11—show how local events as emergent can reverberate globally. The Russo-Ukrainian war in 2022 has similarly sent energy and geopolitical shockwaves from regions to the entire world system. It appears that as complexity deepens, regional orders gain importance relative to any single global order: the international system survives by becoming more dissipative, more networked, more regionally anchored (Straussfogel, 1997, p. 123).

Crucially, emergence in order and emergence in warfare are not separate stories. They shape each other continuously. The old triad of power, interest, and norms no longer fully captures how order works (Dehghani Firozabadi & Zabihi, 2024, pp. 8–9); new actors and new dynamics—such as China's Belt and Road Initiative, BRICS, the growing legitimacy of non-Western IR perspectives, and the rise of armed non-state groups—are reshaping the system from within. In security, these emergent forces challenge traditional state-centric frameworks and introduce novel forms of violence. At the same time, artificial intelligence and other technological ruptures are transforming both the tools of war and the logic of conflict management, shifting from centralized command structures to decentralized on-the-ground decision-making (Doughty, 2014, p. 24). Paradoxically, while war management decentralizes, network-centric warfare exhibits a countervailing tendency toward centralization at the structural level, with conflicts increasingly concentrated at the nodes of networked systems. The "centrality" dynamic, intrinsic to network theory, becomes particularly salient in the context of modern networked warfare.

Beyond the internal processes that shape interactions within a network, the positioning of actors—or the network's topology—exerts a powerful influence of its own. Where actors sit in relation to one another determines whether interactions tilt toward cooperation or conflict (Kacziba, 2021, p. 165). In highly institutionalized settings like the European regional network, power crystallizes through durable organizations and collective security regimes. But in networks that lack structural and normative coherence—where uncertainty and emergence prevail—conflict becomes the dominant mode of interaction, and power is expressed through militarization, hedging, and ad hoc alliances.

The Middle East is a prime example of a scale-free network, a type of complex-chaotic system in which power naturally concentrates in a few highly connected hubs (main actors). In such networks, the logic of dissipative order pushes the system away from simple decentralization and toward self-organization around central nodes (Wagner, 2016, p. 121, 129). Network theory shows that the structure and interactions of hubs matter far more than the distribution of power among peripheral actors (Jackson, 2014, p. 341). This fundamentally reconfigures how power works relative to classical IR. Functionally, hubs mediate all communication flows—from cooperation and cultural exchange to outright war—and they also control and manage these flows (Bower, 2016, pp. 177–178). Because of their position, hubs can both instigate and regulate conflict. Through the cascading failure process—a chain-reaction in which disrupting a central hub overload connected nodes and risks systemic collapse—a hub becomes simultaneously the most valuable target for an adversary and the most potent source of threat to opposing networks (Guo et al., 2017). If a hub is compromised, the entire network's integrity is at risk (Duan et al., 2019, p. 22454). This marks a deep structural shift: the expansive power that once defined traditional international relations gives way to intensive, hub-centered power. War, as a networked interaction, increasingly gravitates toward these hubs. Its inception, its trajectory, and its ultimate objectives are all intimately tied to the network's central nodes.

2. Network Analysis

The Middle East has been a theater of chronic conflict, shaped by both regional rivalries and persistent foreign intervention driven by geostrategic and economic interests—a constant since the 18th century and especially after the Ottoman Empire's collapse (Barr, 2019). This turbulent history has given the regional network its scale-free, amorphous character. While the presence of external powers remains unchanged, this article argues that their role has been fundamentally transformed and reconfigured by a networked regional order, best understood through complexity-chaos theory. This transformation is visible across the nature of warfare, its causes, and its participants. Table 1 traces these shifts across five historical phases, revealing a striking interplay of continuity and change.

Table (1): The Transformation of Warfare in the Middle East (From WWI to the Present)

	Period (CE)	Type of Conflict	Causal Factors	Key Actors	Historical Evidences
Phase 1: Anti-Colonial Wars and State Formation	1918-1948	Anti-colonial movements; State-building conflicts	Collapse of the Ottoman Empire; Zionist Regime/Arab nationalism; European mandates	France and the UK as colonial powers; Newly established Arab states; Jewish paramilitary groups	Arab-Zionist War (1948)
Phase 2: Pan-Arabism vs. Zionist Regime	1948-1979	Conventional inter-state wars; Ideological conflicts	Pan-Arabism (Nasserism); Preservation of Zionist Regime; Cold War alliances	Egypt; Zionist Regime; Syria; USSR and the US	Quadrilateral Arab-Zionist Wars
Phase 3: Interstate Wars	1980-2001	Interstate wars with sectarian undertones; Civil war	Iranian Revolution; Oil-centric policies; Sunni-Shia sectarianism	US and other major powers; Iran; Iraq; Saudi Arabia; Non-state actors (Hezbollah)	Iran-Iraq War; Lebanese Civil War
Phase 4: Regime Change and Chaos	2001-2011	Asymmetric warfare; Insurgency; State collapse	US intervention; Arab Spring	US; Al-Qaeda; ISIS; Fragmented states (Iraq, Syria)	Iraq War; Afghan War
Phase 5: Proxy Wars and Hybrid Conflicts	2011-Present	Proxy wars; Humanitarian crises; Network-centric warfare	Emerging technologies (cyberwarfare, AI); Regional power rivalries	Iran; Saudi Arabia; Zionist Regime; Russia; US, UK, France; UAE; Non-state actors	Syrian Civil War; Al-Aqsa Storm; Iran-Zionist Regime clashes (e.g., Operation True Promise)

Source: Research Findings

As systemic complexity grows and non-state actors proliferate, frozen conflicts and networked hubs increasingly erode the influence of major powers. What classical IR calls "multipolarization" (Forough et al., 2023) is better understood here as a hub-centric redistribution of decision-making authority, driven by the empowerment of regional nodes and the structural decline of interventionist powers (Kaushiki et al., 2024, p. 205). Regional self-sufficiency in arms production, exemplified by Iran's[1] expanding domestically developed military-industrial complex, further amplifies hub influence, because hard power remains pivotal even in networked systems (Morady, 2011, p. 80).

However, aligned with this article's aim to analyze the structural impact of order on the metamorphosis of warfare, the focus will center on the evolving framework of the Middle East regional network's order and its consequential effects on conflict dynamics. Building on the centrality of hubs in network theory, the centrality metrics outlined in the theoretical framework—degree centrality, closeness centrality, and betweenness centrality—will be applied to assess key regional actors (e.g., Iran, Saudi Arabia) and the foremost intervening powers (the United States and Russia) as regional network hubs. These metrics will then serve as the analytical lens to scrutinize shifts in the functional dynamics of power and their implications for modern warfare within this networked system.

Changing power dynamics—and the resultant transformations across all facets of the network, including warfare and conflict management—are manifested through three centrality metrics (degree, closeness, and betweenness centrality) across four domains: security, economy, culture, and technology. Therefore, to calculate the centrality of actors, indicators such as population, gross domestic product (GDP), access to open seas, annual military expenditures, access to advanced technologies (e.g., cyber, space, and artificial intelligence), alliances, and proxies should be examined. For calculating the Middle East regional network hubs' centrality, the main regional hubs are examined alongside the United States, Russia, and China as intervening powers.

1. For brevity, the term "Iran" is used in place of the "Islamic Republic of Iran."

Table (2): Centrality Indicators for the Middle East Regional Network Hubs

Country[1]	Population[2] (million)	GDP[3] (USD Billions)	Maritime Access	Military Expenditure[4] (USD Billions)	Advanced Technologies	Alliances/Proxies	Regional Conflicts
Iran	90.6	404.6	Persian Gulf, Oman Sea	10.3	Nanotechnology, Cybersecurity, Missile/Space Technology, Drone Industry, Nuclear Technology	Shiite influence expansion via the Shiite Crescent[5]; Yemen's Ansarullah; Russia; China	Syrian Civil War, Yemen War, Gaza War
Türkiye	85.3	1,120	Black Sea, Mediterranean Sea	15.8	Drone Industry, Space Technology	NATO, Qatar, Azerbaijan, Russia (limited)	Syrian Civil War, Libyan Conflict
Saudi Arabia	33.2	1,070	Red Sea, Persian Gulf	75.8	Artificial Intelligence, Renewable Energy	Gulf Cooperation Council (GCC), United States, China	Yemen War
Egypt	114.5	396	Mediterranean Sea, Red Sea	9.7	Satellite Technology, Renewable Energy	Libyan National Army, United States, Saudi Arabia, GCC	Libyan Civil War, Sinai Insurgencies
Zionist Regime	9.7	513.6	Mediterranean Sea	27.5	Psychological Operations, Cybersecurity, Defense Systems (e.g., Iron Dome)	United States, Gulf Cooperation Council	Gaza war (2023), Syrian Civil War
United States	334.9	27,720	Global maritime access	916	Starlink, Artificial Intelligence, Space Technology, Cybersecurity, Quantum Technology	NATO, Zionist Regime	Nearly all the Middle East conflicts since 2001
Russia	143.8	2,020	North Pacific, Arctic,	109	Space Technology, Cybersecurity,	Iran, Syria, Türkiye	Syrian Civil War, Gaza War

1. To avoid non-essential data, only regional states with a significant role and conflict involvement in the region were considered.
2. https://data.worldbank.org/indicator/SP.POP.TOTL
3. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD
4. https://milex.sipri.org/sipri
5. Following Bashar al-Assad's fall, a portion of the northern segment of the Crescent has disintegrated.

Country[1]	Population[2] (million)	GDP[3] (USD Billions)	Maritime Access	Military Expenditure[4] (USD Billions)	Advanced Technologies	Alliances/Proxies	Regional Conflicts
			Black Sea		Missile Systems		
China	1,410	17,800	South China Sea, Pacific Ocean	296	4G/5G Networks, Artificial Intelligence, Quantum Technology, Space Technology	Iran, Saudi Arabia, UAE, BRICS	Non-interventionist policy; economic diplomacy

Source: Research Findings

Iran, Saudi Arabia, Türkiye, Zionist Regime, and Egypt are identified as regional hubs based on their disproportionate geostrategic influence across security, economic, cultural, and technological domains, while the United States, China, and Russia are included as key intervening powers. Although the article acknowledges the significant role of non-state actors, it is not feasible to apply conventional centrality metrics such as population or GDP to actors like Hezbollah and Hamas. Consequently, these entities are operationalized exclusively as Iranian proxy forces. To compute degree, closeness, and betweenness centrality for each hub, indicators from Table 2 are supplemented with additional trade and arms transfer data for validation, collected in Table 3 below.

Table (3): Trade and Arms Transfers in the Middle East Regional Network, 2020–2025

Country	Trade Volume[1] (USD B, 2023)	Arms Imports[2] (SIPRI TIV, M, 2020–2025) Avg	Arms Exports (SIPRI TIV, M, 2020–2024) Avg	Main Arms Suppliers (% of Imports, 2020–2024)	Notes on Arms Transfers
Saudi Arabia (SA)	256.96	1937	0.6	USA (54%), France (12%), Russia (8.6%)	Second largest global arms importer, 8% GDP on military.
Iran (IR)	163.42	13	123	Russia (100%)	Minimal imports (0.2% MENA), missile/UAV production.
Iraq	164.98	22.4	N/A	USA, Russia, South Korea	Counterinsurgency equipment focus.
Zionist Regime (IS)	158.17	546	889.6	USA (66%), Germany (33%), Italy (1%)	15th largest arms importer, US aid, exports advanced systems.
Türkiye (TR)	617.2	327	473.2	USA, Spain, Italy	Domestic UAV production, imports up 69% from 2015–19.

1. https://data.worldbank.org/indicator/TX.VAL.MRCH.CD.WT
https://data.worldbank.org/indicator/TM.VAL.MRCH.CD.WT
2. https://www.sipri.org/databases/armstransfers

Country	Trade Volume[1] (USD B, 2023)	Arms Imports[2] (SIPRI TIV, M, 2020–2025) Avg	Arms Exports (SIPRI TIV, M, 2020–2024) Avg	Main Arms Suppliers (% of Imports, 2020–2024)	Notes on Arms Transfers
Egypt (EG)	125.27	931.4	17.4	Russia (44% increase), USA, France	8th largest arms importer, imports down 44% from 2015–19.
Syria (SY),	12.69	17.4	N/A	Russia, Iran Limited data	Russian/Iranian regime support.
Jordan (JO)	36.92	61.2	85.8	USA, China, UK	US-funded border security imports
Lebanon (LB)	22.27	28.2	N/A	USA, France	Minimal imports, economic crisis, US aid
UAE (AE)	954.01	756.6	90.6	USA (majority), South Korea, France	11th largest arms importer, down 19% from 2015–19.
Qatar (QA)	128.18	1956.4	16	USA, France, Italy	Third largest arms importer, up 311% from 2013–17.
Kuwait (KW)	97.2	840.2	N/A	USA, France, Italy	Air defense, combat aircraft focus
Oman (OM)	99.12	19.6	N/A	USA, UK, France	Maritime security imports, stable
Yemen (YE)	N/A	0.2	N/A	N/A	Minimal formal imports, illicit channels.
Bahrain (BH)	40.18	322.8	N/A	USA, UK	Small-scale US equipment imports.
Palestine (PS)	N/A	0.4	N/A	N/A	No formal arms imports, limited security forces.
United States (US)	5190	887.8	12190	N/A	Largest arms exporter (43% global share), 107 states.
Russia (RU)	727.52	153.4	2220.4	N/A	Arms exports down 64% from 2015–19, MENA focus.
China (CN)	5940	522	1677	Russia (majority)	5th largest arms exporter, imports down 22%.

Source: Research Findings

We now operationalize nodes (actors) and edges (connections between actors), including interactions between nodes and cores. Edges are weighted such that every connection receives a minimum value of 1—whether conflictual or cooperative—and no connection is assigned 0. Three categories—diplomatic, economic, and military—are defined to investigate bilateral relations. The weighting process is detailed below:

Diplomatic (0,1):

- 1: Formal ties (Table 2's alliances, e.g., US–GCC; Table 3's suppliers, e.g., US–Saudi Arabia, UN treaties, Talks), rivalry (e.g., Iran–Zionist Regime) or conflict-related interaction (e.g., Zionist Regime–Palestine, Gaza War).

- 0: No diplomatic interaction, rivalry, or conflict (e.g., Iran–Jordan, no alliances or conflicts).

Economic (0,1):

- 1: Trade volume (Table 3, e.g., UAE's $954.01B) or GDP-based interaction (Table 2, e.g., US's $27,720B) exists, or conflict impacts economy (e.g., Zionist Regime–Palestine, Gaza War trade disruption).
- 0: Negligible trade/GDP or no economic interaction (e.g., Iran–Jordan, low trade, no conflict).
- For N/A trade (Yemen, Palestine), Table 2's GDP (e.g., Yemen ~$20B) used or score 0 in case of irrelevant was allocated.

Military (0,1):

- 1: Arms transfers (Table 3, e.g., Qatar's 1,956.4M TIV), supplier ties (e.g., US–Saudi Arabia, 54%), military expenditure (Table 2, e.g., Saudi Arabia's $75.8B), or conflicts/rivalries (Table 2, e.g., Iran–Zionist Regime, Gaza War).
- 0: No arms, expenditure, or conflict ties (e.g., Iran–Jordan, no TIV or conflicts).

Total Weight:

- Sum of categories, ensuring at least 1 for any connection.
- 0 only for no meaningful connection.

Therefore, weights range from 0 (minimum, indicating no meaningful connection) to 3 (maximum, indicating full connection across all three categories). Table 4 illustrates the edge-weighting process.

Table (4): Edge-Weighting the Middle East Regional Network

	BH	CN	EG	IR	IQ	IS	JO	KW	LB	OM	PS	QA	RU	SA	SY	TR	AE	US	YE
BH	0	2	3	1	1	3	3	3	1	3	1	3	2	3	1	2	3	3	2
CN	2	0	2	3	3	2	3	3	2	2	2	3	3	3	1	3	3	3	1
EG	3	2	0	1	2	3	3	3	2	2	3	2	3	3	0	3	3	3	2
IR	1	3	1	0	3	1	1	2	3	3	3	2	3	3	0	3	3	3	3
IQ	1	3	2	3	0	1	3	2	2	2	2	2	3	3	1	3	3	3	1
IS	3	2	3	1	1	0	3	1	1	1	1	3	3	3	1	3	3	3	1
JO	3	3	3	1	3	3	0	3	2	2	3	3	3	3	2	3	3	3	2
KW	3	3	3	2	2	1	3	0	2	3	1	3	3	3	1	3	3	3	2
LB	1	2	2	3	2	1	2	2	0	2	2	2	3	2	1	2	2	3	2
OM	3	2	2	3	2	1	2	3	2	0	2	3	3	3	1	3	3	3	2
PS	1	2	3	3	2	1	3	1	2	2	0	2	1	2	1	1	1	1	2
QA	3	3	2	2	2	3	3	3	2	3	2	0	3	3	3	3	3	3	2
RU	2	3	3	3	3	3	3	3	3	3	1	3	0	3	2	3	3	2	1
SA	3	3	3	3	3	3	3	3	2	3	2	3	3	0	3	3	3	3	3
SY	1	1	0	0	1	1	2	1	1	1	1	3	2	3	0	3	2	3	0

	BH	CN	EG	IR	IQ	IS	JO	KW	LB	OM	PS	QA	RU	SA	SY	TR	AE	US	YE
TR	2	3	3	3	3	3	3	3	2	3	1	3	3	3	3	0	3	3	2
AE	3	3	3	3	3	3	3	3	2	3	1	3	3	3	2	3	0	3	2
US	3	3	3	3	3	3	3	3	3	3	1	3	2	3	3	3	3	0	2
YE	2	1	2	3	1	1	2	2	2	2	2	2	1	3	0	2	2	2	0

Source: Research Findings

As mentioned, the relationships between key actors have been weighted based on their cooperative or conflictual nature. For instance, the US and Saudi Arabia share military (alliance), economic (oil), and diplomatic (embassies) relations, so their bilateral connection is weighted 3. US-Iran relations include military (proxy conflict), economic (sanctions), and diplomatic dimensions—while no embassies exist, negotiations such as the JCPOA and the 2025 US-Iran talks count as diplomatic engagement. Therefore, a weight of 3 is also allocated to their relations. Iran-Syria relations were assigned 0 following Bashar al-Assad's fall. This process was similarly applied to every bilateral relation in the Middle East countries matrix based on the data from Tables 2 and 3. In the next step of quantification, centrality metrics are calculated. Normalization is also applied to rescale metrics to a standard range, enhancing comparability across nodes and easing interpretation.[1]

- **Degree Centrality**

Degree centrality measures the strength of a hub's direct connections (both cooperative and conflictual). A higher degree centrality indicates greater engagement and influence, while a lower value reflects limited impact. It is calculated as the sum of the edge weights connected to the hub. For enhanced precision, maritime access (geostrategic advantage) is added to the total edge weight. The results are presented below:

Table (5): Degree Centrality for the Middle East Regional Network Nodes

Country	Degree Centrality	Maritime Access Score	Total Adjusted Degree	Normalized Degree Centrality	Explanation
United States (US)	50	4 (Indirect access)	54	0.931	Global Ties
Saudi Arabia (SA)	52	2 (Persian Gulf, Red Sea)	54	0.931	Hub role
UAE	49	2 (Persian Gulf,	51	0.879	Trade hub (e.g.,

1. See Appendix A for details.

Country	Degree Centrality	Maritime Access Score	Total Adjusted Degree	Normalized Degree Centrality	Explanation
(AE)		Oman Sea)			QA, SA = 3, $954.01B trade, Table 7)
Türkiye (TR)	49	1 (Mediterranean)	50	0.862	NATO, Qatar ties
Qatar (QA)	48	1 (Persian Gulf)	49	0.844	GCC, Türkiye ties
Jordan (JO)	48	1 (Red Sea)	49	0.844	US, GCC ties
Russia (RU)	47	2 (Caspian + Mediterranean)	49	0.844	Iran, Syria ties
China (CN)	44	3 (Indirect access)	47	0.810	Global trade
Egypt (EG)	43	2 (Mediterranean, Red Sea)	45	0.775	Hub ties (e.g., US, SA = 3), no tie to SY
Kuwait (KW)	44	1 (Persian Gulf)	45	0.775	GCC ties
Oman (OM)	43	1 (Oman Sea)	44	0.758	GCC, neutral ties
Iran (IR)	41	3 (Persian Gulf, Oman Sea, Caspian Sea)	44	0.758	Shiite Crescent (e.g., PS = 3), no tie to SY.
Iraq (IQ)	40	1 (Persian Gulf)	41	0.706	Conflict ties
Bahrain (BH)	40	1 (Persian Gulf)	41	0.706	GCC proximity
Zionist Regime (IS)	37	1 (Mediterranean)	38	0.655	US, EG ties
Lebanon (LB)	36	1 (Mediterranean)	37	0.637	Conflict ties
Yemen (YE)	32	1 (Red Sea)	33	0.568	Conflict ties, (e.g., SA = 3, Yemen War, Table 2).
Palestine (PS)	31	1 (Mediterranean)	32	0.551	Limited ties (e.g., IR = 3, SA = 2, Gaza War).
Syria (SY)	26	1 (Mediterranean)	27	0.465	Conflict ties

Source: Research Findings

Indirect maritime access further shapes hub centrality. The United States operates from bases across the Persian Gulf, Oman Sea, Red Sea, and Mediterranean; Russia relies on its Tartus naval facility; and China gains entry via Djibouti (Bab-El-Mandeb), Duqm Port (Oman), and Khalifa Port (UAE). Consequently, the US scores a centrality of 54, matching Saudi Arabia, with the UAE (51) and Türkiye (50) close behind. Saudi and Türkiye's deeper regional engagement amplifies their weight. China's port access (47) already rivals Russia's, while Iran's reach across the Persian Gulf, Oman Sea, and Caspian Sea boosts its centrality despite sanctions and geopolitical marginalization. These findings highlight how geography and global power projection jointly shape influence in the Middle East.

- **Closeness Centrality**

Closeness centrality quantifies a hub's ability to reach others via short, strong paths to rapidly mobilize resources and information within the network. Therefore, higher weights indicate stronger ties and shorter distances. Closeness centrality is derived from the following formula:

$$\text{Closeness }(i)=\frac{n-1}{\sum_{i\neq j} d(i,j)}$$

where n is the number of network nodes (19 for the Middle East regional network) and $d(i، j)$ represents the shortest path distance between hubs i and j. Closeness centrality is calculated by inverting the edge weight between nodes; a higher weight signifies greater proximity between nodes. If the edge weight is 0 (no direct connection), the distance is treated as infinite, and the shortest indirect path is used instead. Below are some examples showing how the formula applies:

Iran–United States Edge (Weight = 3):

Direct connection exists.

Closeness centrality: $\frac{1}{3} \approx 0.33$ (inverse of edge weight).

Iran–Zionist Regime Edge:

No direct connection.

Shortest path: Iran → Russia (Weight = 3) → The US (Weight = 3) → Zionist Regime (Weight = 3).

Total path distance = 9

Closeness centrality = $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$

A higher closeness centrality denotes the hub's enhanced accessibility and dominance within the network, while a lower value signifies the actor's geopolitical marginalization.

Table (6): Closeness Centrality for the Middle East Regional Network Nodes, Calculated by Python Software 3.12

Country	Closeness Centrality	Normalized Closeness Centrality	Explanation
Saudi Arabia (SA)	0.720	12.960	Central Gulf actor; strong ties to US, Egypt, and Jordan
United States (US)	0.692	12.456	Direct high-weight ties (3) to most nodes; shortest paths via hubs like Türkiye
UAE (AE)	0.692	12.456	Persian Gulf hub; ties to the US, Saudi Arabia, and China
Qatar (QA)	0.692	12.456	Balances Iran and Gulf/US; limited by regional blockades.
Jordan (JO)	0.692	12.456	Mediates US/Gulf ties; Red Sea access boosts connectivity
Türkiye (TR)	0.667	12.006	Bridges NATO (US) and Russia/Syria; key regional connector
Russia (RU)	0.667	12.006	Relies on Syria and Iran; indirect US/EU paths reduce centrality.
Kuwait (KW)	0.643	11.574	Persian Gulf actor; tied to US and Saudi Arabia.
China (CN)	0.643	11.574	Economic ties via BRI; lacks direct military alliances
Egypt (EG)	0.621	11.178	Controls Suez Canal; links Arab states, Zionist Regime, and the US.
Oman (OM)	0.621	11.178	Oman Sea access; neutral diplomacy limits strong alliances.
Iran (IR)	0.600	10.800	Strong ties to Russia/China but isolated from Syria and Persian Gulf states.
Bahrain (BH)	0.600	10.800	US naval base host; Persian Gulf centrality
Iraq (IQ)	0.600	10.800	Connects Iran and Gulf states; disrupted by internal instability
Zionist Regime (IS)	0.581	10.458	Strong US/Egypt ties but adversarial relations with neighbors
Lebanon (LB)	0.581	10.116	Mediterranean access but weakened by internal crises
Yemen (YE)	0.562	10.116	Isolated by civil war; weak ties beyond Iran and Saudi Arabia.
Palestine (PS)	0.529	9.522	Geopolitically fragmented; reliance on Egypt/Jordan.
Syria (SY)	0.514	9.252	Reliant on Russia and Iran; isolation post-Assad weakens centrality.

Source: (Python Software Foundation, 2023)

Saudi Arabia's dense alliances and strategic partnerships give it the highest closeness centrality, followed by the US, UAE, Qatar, and Jordan—a ranking that underscores the growing weight of resident hubs. Türkiye and Egypt serve as bridges between regional blocs such as NATO, Arab states, and Russia. Iran's closeness remains constrained, despite its geographic advantages, by Assad's fall, sanctions, and diplomatic isolation from GCC states. Palestine and Syria, ravaged by conflict and fragmentation, score the lowest. The analysis reaffirms how alliances and geography, especially maritime chokepoints, jointly shape influence in the Middle East.

- **Betweenness Centrality**

Betweenness centrality, which measures a hub's control over critical communication corridors and its role as a "bridge" on the shortest paths between other countries, is calculated using the following formula:

$$\text{Betweenness } (i) = \sum_{s \neq i \neq t} \frac{\sigma st(i)}{\sigma st}$$

where $\sigma_{st}(i)$ is the number of shortest paths between nodes s and t that pass-through node i, and σ_{st} is the total number of shortest paths between s and t. To operationalize this, edge weights are first inverted to distances (e.g., a weight of 2 becomes a distance of $\frac{1}{2}$), shortest paths between all node pairs are computed, and paths traversing the node of interest are counted. A higher betweenness centrality indicates the node's dominance over strategic pathways, while a lower value reflects peripheral influence or reliance on intermediary actors (Newman, 2010, Chapter 7). Based on the aforementioned formulas, the quantification of centrality components for key actors in the Middle East regional network is presented in Table 7 below**.**

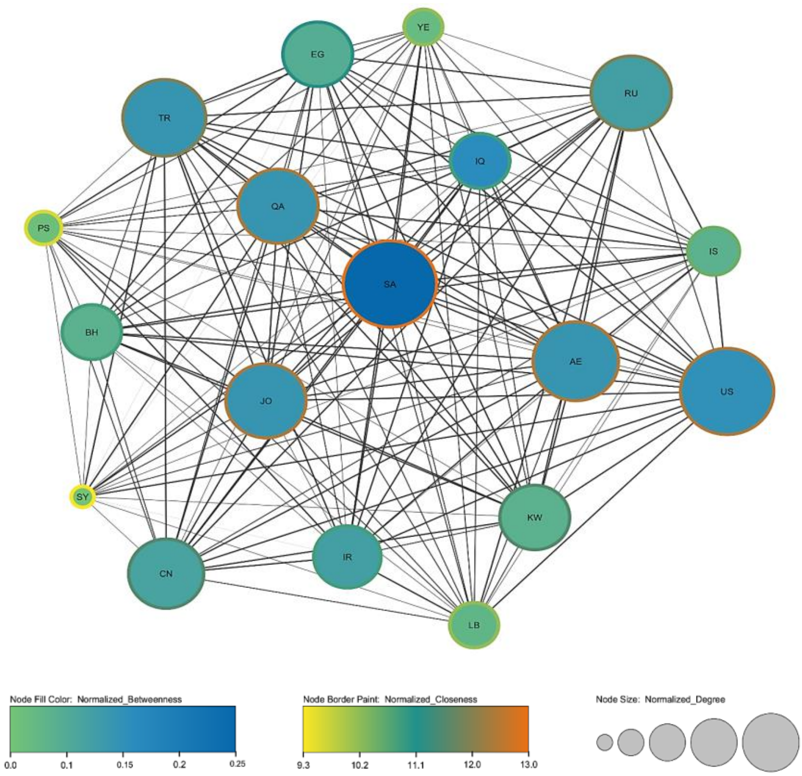
Table (7): Betweenness Centrality for Middle East Regional Network Nodes

Country (Nodes)	Raw Betweenness	Normalized Betweenness	Explanation
Saudi Arabia (SA)	23.833	0.188	Hub bridge
Iraq (IQ)	18.833	0.123	Conflict bridge
United States (US)	17.833	0.116	Global bridge
Jordan (JO)	16.833	0.110	US–GCC bridge
Türkiye (TR)	16.833	0.110	NATO–Qatar bridge
UAE(AE)	16.833	0.110	Trade bridge
Qatar (QA)	16.833	0.110	GCC–Turkey bridge
Iran (IR)	14.833	0.096	Shiite Crescent, Hormuz Strait

Country (Nodes)	Raw Betweenness	Normalized Betweenness	Explanation
Russia (RU)	14.833	0.096	Iran, Syria bridge
China (CN)	13.833	0.090	Global trade bridge
Oman (OM)	12.833	0.083	Neutral GCC bridge
Egypt (EG)	11.833	0.077	Hub bridge
Kuwait (KW)	10.833	0.070	GCC bridge
Bahrain (BH)	10.833	0.070	GCC bridge
Zionist Regime (IS)	10.833	0.070	US–EG paths, rivalry
Lebanon (LB)	9.833	0.064	Conflict bridge
Yemen (YE)	8.833	0.057	Conflict bridge
Palestine (PS)	7.833	0.051	Limited bridge
Syria (SY)	6.833	0.044	Conflict bridge

Source: (Python Software Foundation, 2023)

Raw betweenness captures the unnormalized fraction of shortest paths passing through a node; normalized betweenness divides that by the maximum possible value (153 for this 19-node network), yielding a score between 0 and 1. The US and Saudi Arabia register high betweenness, reflecting their dense connections and frequent position on shortest paths. Iraq's elevated score signals its growing role as a bridge, especially for Iran following Bashar al-Assad's fall. Yemen and Palestine remain peripheral, while Syria's collapse—from a vital Shiite Crescent nexus to the lowest score—underscores the unconsolidated HTS administration and regional reluctance to engage. Iran, despite its geostrategic position, scores only moderately following the disruption of the northern Axis of Resistance. The analysis thus distinguishes geopolitical brokers like Türkiye and Saudi Arabia, who mediate through diplomatic leverage, from bottlenecks like Iran and Egypt, whose power lies in controlling chokepoints such as the Strait of Hormuz and the Suez Canal. Great powers respond accordingly: the US and China invest in partnerships with brokers while securitizing bottlenecks. Figure 1 maps the Middle East regional network by node attributes. Based on the information from the above tables, Figure 1 below presents the regional network of the Middle East based on nodes' attributes within it.



Source: (Shannon et al., 2003)

Figure (1): The Middle East Regional Network (2023–2025)

In the network diagram, node size reflects normalized degree centrality (Table 5), border color indicates closeness centrality (Table 6), and fill color shows betweenness centrality (Table 7); edges are weighted by connection strength (Table 4). The concurrent dynamics of change and continuity are evident in the Middle East regional network. The United States remains the dominant external hub, historically shaping regional decisions either unilaterally or in collaboration with other major powers, but the crucial shift is the growing weight of regional hubs. Iran and Egypt control strategic chokepoints, while Saudi Arabia, Qatar, and Türkiye exercise diplomatic leverage—realities that intervening powers can no longer overlook. This reconfiguration drives conflict toward hub targeting: regardless of geography, hostilities increasingly concentrate on central nodes because disrupting an adversary's network through its hubs is cost-effective and strategically optimal. Moreover, hub centralization now shapes both the outbreak and the management of conflict, placing resident hubs in a dual role as prime targets and essential peacemakers. The fall of Assad and the weakening of the Axis of Resistance exemplify a strategic blow aimed at curtailing Iran's hub role as a bottleneck and limiting its control over critical transit routes.

Given the qualitative weighting of centrality factors and the inherent complexities and uncertainties in international relations, this study conducts a sensitivity analysis to examine how centrality metrics respond to perturbations in edge weights within the Middle East regional network. A global sensitivity analysis via Monte Carlo simulation—a computational technique employing random sampling to model uncertainty—is applied (Saltelli et al., 2007). All weights in Table 4 are subjected to ±20% variation, with centrality recalculated for all 19 nodes to quantify sensitivity.

Table (8): Sensitivity Analysis of Centrality Metrics for the Middle East Regional Network[1]

Node	Key edge	Max % Change Degree	Max % Change Closeness	Max % Change Betweenness	Sobol Index (Betweenness)
BH	BH-SA	1.70	0.28	14.29	0.25
CN	CN-SA	1.48	0.26	13.33	0.24
EG	EG-SA	1.55	0.27	12.99	0.24
IR	IR-SA	1.58	0.28	12.50	0.25
IQ	IQ-SA	1.70	0.28	11.38	0.23
IS	IS-SA	1.83	0.29	14.29	0.25
JO	JO-SA	1.42	0.24	10.91	0.23
KW	KW-SA	1.55	0.26	14.29	0.25
LB	LB-SA	1.88	0.30	15.63	0.27
OM	OM-SA	1.58	0.27	12.05	0.24
PS	PS-SA	4.17	0.38	25.53	0.40
QA	QA-SA	1.42	0.24	10.91	0.23
RU	RU-SA	1.42	0.25	11.46	0.24
SA	SA-US	1.29	0.28	5.32	0.20
SY	SY-TR	5.81	0.62	25.00	0.44
TR	TR-US	1.39	0.25	10.91	0.23
AE	AE-US	1.37	0.24	10.91	0.23
US	US-AE	1.29	0.29	5.17	0.20
YE	YE-SA	3.52	0.30	19.30	0.35

Source: Research Findings

1. See Appendix B for formulas and calculations.

According to Table 8, the US and Saudi Arabia show the highest resilience (less than 1.3% change), reflecting their dense multilateral ties, while Türkiye and the UAE also remain robust (under 1.4%). At the other end, Syria, Palestine, and Yemen prove most sensitive (over 3.5%) due to limited connections, with other actors falling in an intermediate range (1.4–1.9%). Closeness centrality is the least sensitive measure, pointing to stable network distances; betweenness centrality, by contrast, is the most responsive, underscoring that the quality of connections matters most—a result confirmed by Sobol index analysis. Saudi Arabia and the US exhibit lower betweenness sensitivity thanks to their resilient bridging roles, whereas Zionist Regime's higher betweenness sensitivity relative to Iran (empirically visible during the 12-day conflict) highlights its reliance on regional intermediaries compared to Iran's military self-sufficiency. Critically, the weak nodes—Palestine, Yemen, and Syria—have elevated Sobol indices (0.35–0.44), signaling structural precariousness. Strengthening them and their key edges would not only stabilize the network but also support cooperative frameworks for conflict resolution, humanitarian response, and tension reduction across the region**.**

3. Discussion: The Role of Regional Hubs in Networked Warfare

To examine hubs' role in networked warfare, each centrality metric must be analyzed separately. High degree centrality, reflecting dense connections and extensive regime participation, brings strategic benefits but also entangles the hub in its allies' conflicts, as the US illustrates across Ukraine, Gaza, and the Taiwan Strait. High betweenness centrality, reflecting control over strategic pathways, incentivizes the hub to assert dominance while prompting rivals to challenge it, epitomized by Iran's drive to consolidate the Axis of Resistance and the counter-efforts to marginalize it. High closeness centrality, enabling rapid resource access, facilitates swift power projection, visible in Türkiye's drone deployments and Iran's missile-enabled asymmetric tactics. Unsurprisingly, hubs dominate regional conflicts. Table 9 details their roles in Middle Eastern wars and confrontations from 2011 to 2025.

Table (9): Middle East Conflicts and Hub Engagements, 2011–2025

Countries (Nodes)	Number of Engagements	Where they engaged	Degree Centrality
United States	5	Syria, Iraq, Yemen, Libya, Iran	54
Saudi Arabia	4	Yemen, Syria, Iraq, Lebanon	54
UAE	3	Yemen, Libya, Syria	51
Türkiye	4	Syria, Iraq, Libya, Türkiye -Kurdish	50
Jordan	2	Syria, Yemen	49
Qatar	3	Syria, Yemen, Libya	49
Russia	2	Syria, Libya	49
China	0	no direct military involvement	47
Egypt	3	Libya, Yemen, Sinai	45
Kuwait	1	Yemen	45
Iran	7	Syria, Yemen, Iraq, Lebanon, Zionist Regime-Palestine, Zionist Regime, US	44
Oman	0	mediator, not directly involved	44
Bahrain	2	Yemen, Bahrain	41
Iraq	2	Iraq, Syria	41
Zionist Regime	4	Zionist Regime-Palestine, Syria, Lebanon, Iran	38
Lebanon	2	Syria, Lebanon	37
Yemen	2	Yemen, Zionist Regime	33
Palestine	1	Zionist Regime-Palestine	32
Syria	1	Syria	27
Total Number of conflicts for hubs by degree centrality ≥ 43[1]	34	Average Conflicts per Node	34 / 12 ≈ 2.83
Total Number of conflicts for nodes by degree centrality < 43	14	Average Conflicts per Node	14 / 7= 2

Source: (Armed Conflict Location & Event Data Project, 2023)

According to the table, hubs have experienced on average 14.1% more conflicts than other nodes since 2011—a finding that strongly supports the hub-centric model of networked warfare. While the pivotal role of regional hubs has been clearly demonstrated, most remain aligned with the intervening powers, particularly the United States, which helps perpetuate external influence in the region. Yet the US, as the main hub, is no longer the sole agenda-setter; agency has dispersed across multiple regional and intervening actors, capturing the coexistence of change and continuity in contemporary international relations.

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1. See the Appendix C

At the same time, the inherently conflictual nature of relations among regional actors, rooted in the scale-free structure of the network, makes sustainable, long-term cooperation among indigenous members unlikely. Interactions tend instead to produce localized, hub-centric, and often protracted or seemingly endless conflicts. Among the resident hubs, Iran stands apart. Its strategic military self-sufficiency, doctrinal resistance to alignment, and refusal to capitulate to external pressure make it the most disruptive node for the main regional and international hub, the United States. Historically, Washington has shown unwavering commitment to its super-strategic role in this network and is unlikely to voluntarily cede agency. Iran, for its part, shows no sign of yielding either. Consequently, regional and external actors alike are actively working to neutralize Iran's influence and inherent geopolitical advantages—from the "war of corridors" to the recent erosion of the Axis of Resistance after Assad's fall and the 12-day Iran-Zionist Regime war. The critical question—one that demands its own scholarly inquiry—is how Iran will safeguard its centrality as a hub going forward.

Conclusion

This study investigates the impact of structural transformations in the international order on the patterns of warfare in the age of chaos-complexity. The article posits that, given the escalating complexity in international relations, there has been a shift in the global order from a hierarchical to a clustered-network structure, fundamentally altering the modalities of power dynamics. This systemic shift is driving profound transformations in all phenomena in the international arena, including warfare. The findings reveal that the transition from a hierarchical to a clustered-network order amplifies the strategic significance of network hubs, empowering them to play decisive roles within regional and international networks. Consequently, power dynamics are shifting from extensive to intensive forms, leading to a corresponding evolution in warfare and conflict patterns. Rather than large-scale, geographically dispersed engagements, conflicts are increasingly hub-centric, reflecting the intensive power of key hubs.

To validate this thesis, the study employs complexity and network theory to examine centrality metrics within the Middle East regional network. The analysis demonstrates significant changes in the influence of resident network hubs over regional events, including conflicts and conflict management. Notably, since 2011—

the second phase of fourth-generation warfare (4GW)—and especially during the Gaza war and the Iran-Zionist Regime 12-day strikes, resident hubs in the Middle East regional network (e.g., Iran, Türkiye, Saudi Arabia, UAE) have emerged as pivotal actors alongside traditional intervening powers. This shift has reoriented warfare away from the full-scale, interventionist-driven conflicts of the past toward targeted hub-centric warfare, where hostilities focus on critical network hubs. Such conflicts are characterized by intensive power projection, hub-centric, limited-scope confrontations with prolonged durations that spill over the network through engaging the hubs. However, the sensitivity analysis shows that weaker nodes could amplify the vulnerability of the Middle East regional network during protracted conflicts, intensifying humanitarian challenges. At the same time, resilient hubs could use their abilities to control the escalation of conflicts or humanitarian issues. This reconfiguration of the regional order thus directly reshapes the pattern of warfare on the global stage, prioritizing hub control over territorial dominance.

Nevertheless, the study underscores the need for further research to explore additional variables. These include the impact of changes in the international order on warfare patterns, the influence of neighboring regional orders on a given region's developments, the role of node collaborations in neutralizing adversarial nodes, and the effects of emerging technologies such as artificial intelligence in either amplifying or diminishing the role of regional structures in transforming warfare patterns. These areas delineate the scope for future studies and research.

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