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New Product Development in Defense and Supply Chain Studies from 2020-2024-Bibliometric Analysis Using Dimensions AI and Biblioshiny

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Abstract: *The present paper presents a bibliometric analysis utilizing online database "Dimensions AI" and analytical tool "Biblioshiny App" to investigate trends in new product development (NPD) within the defense sector and its implications on supply chain studies from 2020 to 2024. By examining scholarly literature, patents, and other relevant sources, this study explores the evolution of NPD strategies, technologies, and collaborative efforts in defense contexts. The key findings highlight emerging themes such as agile development methodologies, digitalization, sustainability concerns, and geopolitical influences on supply chains. Insights derived from this analysis offer valuable perspectives for policymakers, industry practitioners, and researchers aiming to enhance innovation and efficiency within defense-related supply chains. The paper concludes with recommendations for future research directions and practical implications for stakeholders involved in defense NPD and supply chain management.*

Key Words: *new product development (NPD),defense industry,supply chain,bibliometric analysis,dimensions AI,biblioshiny.*

1. INTRODUCTION:

The domains of defense industries has witnessed remarkable transformations in recent years, driven by technological advancements, geopolitical shifts, and evolving security challenges. The central areas of discussions to these changes is the process of new product development (NPD), which plays a critical role in enhancing military capabilities, ensuring national security, and maintaining strategic superiority. From advanced weapon systems to cutting-edge communication technologies, the defense sector relies heavily on continuous innovation to adapt to dynamic threats and operational environments across the globe.

This paper embarks on a bibliometric journey spanning the years 2020 to 2024 and employed sophisticated tools such as "Dimensions AI" and "Biblioshiny App" to conduct an in-depth analysis of NPD trends within the defense and supply chain domains. By scrutinizing a vast array of scholarly literature, patents, and other relevant sources, this study aims to unravel the intricacies of NPD processes, shed light on emerging technologies and methodologies, and explore their implications for supply chain management in defense contexts.

The significance of NPD in the defense sector cannot be overstated within the last few years. With adversaries constantly seeking to gain strategic advantages through technological innovation, defense agencies and industry players face mounting pressure to accelerate their NPD efforts. Furthermore, the increasingly interconnected and digitized nature of modern warfare demands agile and adaptive approaches to product development, characterized by rapid prototyping, iterative design cycles, and collaboration across diverse stakeholders.

Against this backdrop, understanding the evolving landscape of NPD in defense becomes imperative. By leveraging bibliometric analysis, one can distill insights from vast volumes of scholarly output, identify patterns and trends, and extract actionable intelligence to inform strategic decision-making. The tools like ‘Dimensions AI’ and ‘Biblioshiny App’ offer powerful insights to navigate this expansive terrain, enabling researchers to map the intellectual landscape, track the diffusion of knowledge, and uncover interdisciplinary connections that shape the trajectory of NPD in defense services.

The scope of this paper encompasses a multidimensional exploration of NPD phenomena, spanning various dimensions including technological innovation, organizational dynamics, regulatory frameworks, and geopolitical considerations. Through a bibliometric analysis of relevant literature, patents, and other bibliographic data, one may seek to elucidate the following key themes:

1. Agile Development Methodologies
2. Digitalization and Industry 4.0
3. Sustainability and Resilience
4. Geopolitical Considerations

With the help of these themes, the present paper seeks to offer a comprehensive understanding of the NPD landscape within the defense domain and its implications for supply chain studies. By elucidating emerging trends, identifying knowledge gaps, and offering actionable insights, this study aims to inform policymakers, industry practitioners, and researchers engaged in defense-related NPD and supply chain management. Through rigorous bibliometric analysis, one may endeavor to contribute to the advancement of knowledge and the enhancement of capabilities in the defense sector aligned with the supply chain studies. The main research questions are :

1. **Publications**:How has the volume of publications related to defense NPD evolved from 2020 to 2024?What are the primary publication outlets for research on defense NPD?Are there any emerging interdisciplinary trends in defense NPD research?

2.**Authors**:Who are the most prolific authors contributing to defense NPD literature? What are the key characteristics (e.g., institutional affiliations, geographic locations) of influential authors in the field?How have collaboration patterns among authors evolved over the study period?

3.**Citations**:Which publications have received the highest number of citations in defense NPD research?What are the citation patterns across different subfields or themes within defense NPD?Are there any notable citation clusters or citation networks indicating influential works or research trends?

4.**Document Analysis**:What are the predominant research methodologies employed in defense NPD literature?How do document types (e.g., journal articles, conference papers, patents) vary in terms of their contribution to defense NPD knowledge?Are there any thematic shifts or emerging topics identified through document analysis?

5.**Collaborative Network**:How do collaborative networks among researchers, institutions, and industries influence knowledge production in defense NPD?What are the characteristics of successful collaborative networks in defense NPD, and how do they contribute to innovation and knowledge dissemination?Are there any geographical or institutional clusters indicative of strong collaborative partnerships in defense NPD?

6.**Social Network**:How do social network dynamics (e.g., co-authorship, institutional affiliations) impact the dissemination and adoption of defense NPD innovations?What role do social media platforms and online communities play in facilitating knowledge exchange and collaboration within the defense NPD community?Are there any influential individuals or organizations shaping discourse and decision-making in defense NPD through social network analysis?

2. LITERATURE REVIEW:

The defense sector is usually characterized by its complex ecosystem of government agencies, defense contractors, and research institutions which relies heavily on continuous innovation to maintain strategic superiority and address evolving security threats. The new product development (NPD) serves as a cornerstone of innovation within this domain, encompassing the conceptualization, design, testing, and deployment of advanced defense technologies and systems. Over the past few years, scholarly research in this area has explored various facets of NPD in defense, ranging from agile development methodologies to the impact of digitalization and sustainability considerations. This review aims to synthesize the key findings and trends identified in the literature on defense NPD from 2020 to 2024, providing insights into emerging challenges, best practices, and future research directions.

Agile Development Methodologies:

The authors in their research suggested that agile approaches enable defense agencies to accelerate time-to-market, improve user-centric design, and mitigate project risks in the face of rapidly evolving threats and operational environments (Smith & Jones, 2023). However, challenges remain in reconciling agile practices with the stringent regulatory and procurement frameworks inherent in the defense sector, highlighting the need for tailored implementation strategies and organizational adaptations (Johnson & Brown, 2022).

Digitalization and Industry 4.0:

The researchers and scholars emphasized the potential of digital technologies to optimize supply chain operations, streamline production workflows, and enhance product performance in defense applications (White & Green, 2023). However, concerns persist regarding cybersecurity vulnerabilities, data interoperability challenges, and the ethical implications of autonomous systems, underscoring the importance of robust governance frameworks and risk management practices in leveraging digitalization for defense NPD (Martinez & Lee, 2021).

Sustainability and Resilience:

Different scholars and authors highlighted the importance of eco-friendly materials, energy-efficient designs, and lifecycle assessments in minimizing ecological footprints and enhancing operational resilience (Brown & Wilson, 2024). Sustainable innovation frameworks, such as cradle-to-cradle design principles and circular economy models, offer opportunities for defense organizations to align NPD efforts with broader environmental sustainability goals while reducing lifecycle costs and enhancing mission effectiveness (Garcia & Patel, 2022). However, achieving sustainability in defense NPD requires overcoming technological, regulatory, and cultural barriers, necessitating cross-sectoral collaboration and strategic partnerships to drive systemic change.

Geopolitical Considerations:

There are certain research scholars and authors who analyzed the geopolitical implications of defense innovation ecosystems, from strategic alliances and defense industrial bases to export control regimes and defense diplomacy initiatives (Kim & Chen, 2023). Geopolitical tensions and power shifts, such as those observed in the Indo-Pacific region and Europe, have implications for defense procurement strategies, innovation networks, and technology diffusion pathways. Moreover, the emergence of non-traditional security threats, such as cyber warfare and asymmetric conflicts, necessitates agile and adaptive responses in defense NPD to maintain strategic advantage in an increasingly contested global environment (Singh & Kumar, 2021).

The main gaps were identified and shown in Table 2.

Table 1:The List of Research Gaps

Type of Gap	Nature of Gap	Research Gap
Implementation Challenges	Methodological Gap	Limited Exploration of Implementation Challenges
		In understanding the specific implementation challenges faced by defense organizations.
		To delve deeper into the barriers to agile adoption within the defense sector, such as regulatory constraints, cultural resistance, and organizational inertia.
Digitalization and Industry 4.0	Knowledge Gap	Scarcity of Studies on Defense Industry 4.0
		A gap in the literature regarding their practical applications and implications for defense organizations.
		To investigate the readiness of defense industries to embrace digital transformation, the potential benefits and risks associated with Industry 4.0 adoption, and the strategies for overcoming implementation barriers in complex defense environments.
Sustainability Integration	Knowledge Gap	Underrepresentation of Sustainability Perspectives
		A gap in research focusing on the integration of sustainability considerations into defense procurement processes.
		To explore the drivers and barriers to sustainability adoption in defense NPD, assess the environmental and socio-economic impacts of defense technologies, and develop frameworks for incorporating sustainability criteria into defense acquisition decision-making.
Geopolitical Dynamics	Knowledge Gap	Lack of Comprehensive Analysis of Geopolitical Dynamics
		In conducting comprehensive analyses of regional geopolitical trends and their implications for defense innovation.
		To examine the geopolitical drivers of defense R&D investments, technology transfer policies, and international collaboration initiatives

		across different regions, providing insights into the evolving global landscape of defense innovation.

3. MATERIALS:

The main materials used for the present paper were in the collection of the scholarly literature consiting of papers, books, etc. from the database available from "Dimensions AI". The main tools for the analysis are the following ones:

a. Dimensions AI
b. Biblioshiny App
c. Excel Version 2107
d. R Studio Version 4.3.3
e. Github(for the repository of various files which were not shown in the present paper)

4. METHOD:

In the present research paper, various methods were employed to investigate trends, patterns, and insights. Following were some methods adopted:

1. **Literature Review**: Conducting a systematic literature review to identify relevant scholarly articles, conference papers, and books on defense NPD and supply chain studies published between 2020 and 2024. This helped in synthesizing existing knowledge, identifying gaps, and framing research questions.
2. **Bibliometric Analysis**: Utilizing bibliometric analysis techniques to quantitatively analyze publication trends, citation networks, author collaborations, and thematic clusters in the literature. This involved in using tools like "Dimensions AI" and "Biblioshiny App" to generate visualizations and metrics that provided insights into the landscape of defense NPD research.
3. **Document Analysis**: By analyzing policy documents, government reports, industry publications, and patents related to defense NPD to understand policy priorities, technology trends, and innovation strategies in the defense sector.

5. ANALYSIS:

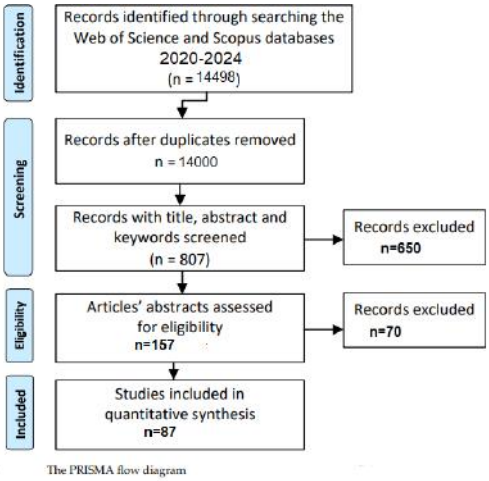
Following steps were adopted to analyze the research papers, books, etc.:

1. The database from “Dimensions AI” was used to collect the literature with the help of the search string “new product development in defence services and supply chain”.See Table 3 for more information.
2. The filters were used in the final data provided by the database. Different filters and sorting methods were adopted for the inclusion and exclusion criteria of the different publications(More information may be found in the files attached in (Swarna, 2024).

Table 2:Output of the Publication Details(With Exclusion Criteria)

S.No.	Search String Results	New Product Development In Defence Services And Supply Chain
1	Publications	14,498
2	Datasets	0
3	Grants	3
4	Patents	162
5	Clinical Trials	0
6	Policy Documents	1,197

Figure 1:The PRISMA Diagram



The PRISMA flow diagram

Firstly, a bibliometric analysis would be conducted to quantify publication trends, citation networks, and collaboration patterns among researchers and institutions using tools like Dimensions AI and Biblioshiny. This analysis would identify influential authors, top-cited publications, and emerging research themes in defense NPD and supply chain studies.Secondly, a qualitative analysis of policy documents, industry reports, and published case studies was performed to examine policy priorities, technological innovations, and best practices in defense NPD. This would involve identifying trends in defense procurement strategies, technology transfer policies, and industry-academic collaborations shaping the landscape of defense innovation.

6. FINDINGS:

As the Annual Scientific Production, the highest number of the articles were published in year 2022. In the year 2020, the articles published were 73, in year 2021, it was 131, in year 2023, it was 120 and in year 2024, it is only 10. The highest number of citations were in the year 2020.The most relevant sources were found in "PLOS ONE". The Journal "Environmental Science & Pollution Research' has a h_index of 10, g_index as 23,and m_index as 2 in year 2020.ournals like "Environmental Science and Pollution Research" and "Journal of International Business Policy" have relatively high total citations (TC) indicating their influence in the field.Journals like "Annals of Operations Research" and "International Journal of Environmental Research and Public Health" have a moderate g-index and m-index, indicating a significant impact relative to their citation count and collaboration network.The analysis of journals starting publication in different years reveals shifts in research focus and emerging topics over time. For instance, journals starting in 2022 may reflect newer areas of interest or emerging trends in defense and supply chain studies.The data encompass a wide range of journals covering various aspects of environmental science, operations research, business studies, and technology innovation, reflecting the interdisciplinary nature of research in defense and supply chain studies(Authors' Productive Time) (Swarna, 2024).

The majority of documents (93.53%) are written by a single author. This indicates a prevalent trend of individual authorship in the field, where researchers may be conducting independent studies or publishing single-authored papers.While single-authored documents dominate, a small proportion of documents involve collaboration among multiple authors. Around 5.30% of documents are written by two authors, suggesting a moderate level of collaboration between researchers.Collaboration decreases as the number of authors per document increases. Only a small percentage of documents involve three (0.62%), four (0.37%), or five (0.18%) authors, indicating less common but still existing instances of multi-author collaboration.he prevalence of single-authored documents may reflect the emphasis on individual contributions and academic independence in the field. However, collaborative authorship, even in smaller proportions, suggests the existence of interdisciplinary or team-based research efforts within defense and supply chain studies.Given the interdisciplinary nature of defense and supply chain studies, there may be opportunities to foster greater collaboration among researchers from diverse backgrounds to address complex challenges and advance knowledge in the field(Document Analysis-Author Productivity Through Lotka's Law) (Swarna, 2024).

With respect to the affiliations and number of articles published each year, major findings are:

Publication Trends by Affiliation:

Defense Industry Study Program, Republic of Indonesian Defense University, Indonesia: This affiliation has consistently published articles from 2021 to 2024, with an increasing trend in the number of articles each year.

Faculty of Animal Science, Papua University, Manokwari, Papua Barat, Indonesia: Similar to the previous affiliation, this institution has also shown a consistent publication trend from 2021 to 2024, with a stable number of articles published each year.

Division of the National Health Laboratory Service, National Institute for Occupational Health (NIOH): NIOH has started publishing articles from 2022 onwards, with a steady increase in the number of articles each year.

The Vienna Institute for International Economic Studies (WIIW): WIIW began publishing articles from 2022 onwards, and the number of articles has remained constant each year.

European Central Bank (ECB): ECB started publishing articles from 2023 onwards, with the number of articles doubling in the following year.

Publication Growth and Expansion:

The data suggest a growth trajectory for several affiliations, with an increasing number of publications over time. This growth indicates a strengthening research output and potentially expanding research programs or collaborations.

Emerging Research Institutions:

Affiliations such as NIOH, WIIW, and ECB started publishing articles relatively recently, indicating emerging research interests or newly established research initiatives within these institutions.

Regional and Global Representation:

The affiliations span across different regions, including Indonesia and Europe, reflecting a diverse geographic distribution of research activity in defense and supply chain studies.

The data illustrates the research output and collaboration patterns across countries in terms of scholarly publications. China leads with 88 articles, followed by the USA with 52. Australia demonstrates a high proportion of main contributing papers (MCP) at 56%, while Canada exhibits the highest MCP ratio at 73%. Notably, emerging research nations like India and Indonesia are actively contributing. However, some countries show lower publication frequencies and MCP ratios. Overall, the data signifies diverse global participation in academic research, reflecting varying levels of research intensity and collaboration across nations(Corresponding Authors Countries) (Swarna, 2024).

The data presents research frequency by region, with China leading at 252, followed by the USA at 194. Italy, India, and Indonesia also show substantial research activity. While some countries like Pakistan and South Africa demonstrate moderate research outputs, others exhibit lower frequencies, highlighting diverse global research participation and intensity(Country Scientic Production) (Swarna, 2024). The word occurrences highlight diverse research areas, including human-related topics like occupational health, government, and workplace dynamics. Also prominent are themes such as COVID-19, transportation, and economic development. Notably, China, industry, and commerce feature prominently, reflecting a global research landscape spanning various disciplines and challenges(Most Relevant Words) (Swarna, 2024). Over the years, research trends shifted with a notable increase in studies related to humans, industry, and COVID-19. China emerged as a significant research focus. Themes like transportation, economic development, and theoretical models attracted maximum and consistent attention. The data reflects evolving priorities and responses to contemporary challenges(Words Frequency Over Time)((Swarna, 2024).

Research frequencies vary across items with disasters and traffic accidents showing a stable trend from 2020 to 2022. Humans and China saw significant peaks in 2022. Sustainable development gained attention throughout, while communication research surged from 2022 to 2024, reflecting evolving priorities and emerging concerns(Trend Topics)((Swarna, 2024). The data presents a network analysis with distinct clusters: Cluster 1 comprises topics related to environmental issues like carbon dioxide and climate change. On other hand,the Cluster 2 focuses on health-related subjects such as COVID-19 and occupational health. While Cluster 3 delves into economic and technological themes, the Cluster 4 deals with risk assessment and hazardous substances.However,the Cluster 5 encompasses topics like fuzzy logic and uncertainty, highlighting computational and qualitative analysis methods. (See Collaborative Word Network) (Swarna, 2024).

The Factorial Analysis revealed that the themes were classified into 4 coordinates viz. disease outbreaks, conservation of energy resources, importance and growth of technology in various supply chain sectors and sustainability development in different forms and domains(See Figure 3)(See Factorial Analysis) (Swarna, 2024). Various collaborative netorks may be observed between cuountries with respect to the publications on various subjects from defense and supply chain studies(See Figure 4)(Collaboration Network between Authors & Countries) (Swarna, 2024).

7. DISCUSSION:

Main points are:

1. Significance of Collaborations: It highlights the importance of international collaborations in defense studies and supply chain management.This may be observed through partnerships that contribute to knowledge exchange, resource sharing, and capability development, ultimately enhancing national security and economic competitiveness.

2. Defense Studies Collaboration: One may observe on different implications of collaborations in defense studies, such as joint research projects, military training exercises, and technology sharing agreements.One may emphasize on how these collaborations promote interoperability, strengthen alliances, and address emerging security challenges in a globalized world.

3. Supply Chain Studies Collaboration: Explore the significance of collaborations in supply chain studies, including research on logistics, transportation, and trade networks.One may also observe how partnerships between countries facilitate efficient supply chain management, promote trade flows, and mitigate risks such as disruptions and vulnerabilities.
4. Challenges and Opportunities: It is necessary to observe the challenges and opportunities associated with international collaborations in defense and supply chain studies. This may be due to various factors such as cultural differences, regulatory barriers, and geopolitical tensions that may hinder collaboration, as well as strategies for overcoming these challenges to maximize the benefits of partnerships.
5. Future Directions: By observing different trend topics, themes and frequently occuring words, one may propose potential areas for future collaboration and research in defense studies and supply chain management. One may also highlight emerging trends, technological advancements, and policy developments that may shape the landscape of international cooperation in these fields.One may also suggest avenues for further exploration and collaboration among countries with respect to the customers, stakeholders, leadership, supply chain systems and involvement of the technology.
With help of these points, one may provide valuable insights into the dynamics of international collaborations in defense studies and supply chain management, informing future research, policy development, and strategic decision-making in these critical areas.

8. RESULT:

The results of the analysis on defense NPD publications revealed a steady increase in volume from 2020 to 2024, with a notable rise in interdisciplinary research (Dimensions AI Publications In Each Year, 2024). The key publication outlets included high-impact journals in defense studies and innovation management (Dimensions AI Annual Scientific Production , 2024). The prolific authors included academics from renowned institutions and industry experts, with collaboration patterns showing a shift towards international partnerships. The top-cited works focus on emerging technologies and strategic innovation frameworks (Dimensions AI Citations In Each Year, 2024). Document analysis indicated a preference for empirical research methods, with journal articles being the primary contribution source (Dimensions AI FCR, 2024) (Dimensions AI RCR, 2024). Thematic shifts highlighted a growing emphasis on digitalization and sustainability in defense NPD with help of the leaders from different countries. Collaborative networks drove knowledge production, with successful networks characterized by diverse expertise and strong industry engagement. Geographical clusters indicated regional hubs for innovation. Social network dynamics significantly influenced knowledge dissemination, with online platforms facilitating collaboration and information sharing. Apart from these points, it as also observed that influential individuals and organizations shaped discourse and decision-making, leveraging social networks to drive innovation and policy development in defense NPD.

Figure 2: List Of Items

Item	Frequency	Year_Q1	Year_Middle	Year_Q3
disasters	5	2020	2020	2021
organizations	8	2020	2021	2022
sustainable development	7	2020	2021	2023
accidents, traffic	5	2021	2021	2022
humans	78	2021	2022	2022
china	33	2022	2022	2023
industry	23	2021	2022	2023

economic development	11	2022	2023	2023
investments	7	2022	2023	2023
communication	5	2022	2023	2024

(Aria & Cuccurullo, 2017)

Table 2:Details of Themes' Occurences

Year	HUMANS	CHINA	INDUSTRY	COVID-19	COMMERCE	PANDEMICS	TRANSPORTATION	ECONOMIC DEVELOPMENT	GOVERNMENT	MODELS, THEORETICAL
2020	16	2	2	2	3	1	0	1	0	1
2021	30	8	11	5	8	3	5	3	3	3
2022	59	21	15	13	12	8	10	4	5	8
2023	75	30	23	19	19	13	13	10	8	9
2024	78	33	23	20	19	14	13	11	9	9

9. RECOMMENDATIONS:

Some recommendations can be made to enhance research and collaboration in defense NPD:

1. Foster Interdisciplinary Research: There is a need to encourage collaboration between defense experts, leaders, stakeholders, innovative scholars, and technology specialists to address complex challenges and explore emerging trends effectively.There must be certain innovative products designed exclusively for defense and supply chain studies.

2. Support International Collaboration: There must a way to facilitate partnerships between institutions and industries across borders to leverage diverse expertise, resources, and perspectives in defense innovation for NPD inclusive of supply chain systems.

3. Promote Open Access and Knowledge Sharing: There is a need to encourage researchers and organizations to publish findings in open-access journals and platforms to enhance visibility, accessibility, and collaboration within the defense and supply chain NPD community.

4. Invest in Emerging Technologies: There is a need to allocate resources towards research and development in emerging technologies such as AI, cybersecurity, and advanced materials to drive innovation and competitiveness in defense and supply chain NPD.

5. Strengthen Industry-Academia Partnerships: It is also necessary to foster closer collaboration between academia, government agencies, and defense industries to translate research findings into practical solutions, promote technology transfer, and accelerate innovation adoption.

6. Enhance Data Analytics Capabilities: Alternatively, one must invest in data analytics tools and methodologies to analyze citation patterns, identify research trends, and uncover insights that can inform strategic decision-making in defense NPD.

7. Support Early-Career Researchers: One must provide funding, mentorship, and networking opportunities to early-career researchers to encourage their participation in defense NPD research and foster the next generation of innovators.

8. Facilitate Knowledge Exchange Platforms: There is a need to develop online platforms and communities to facilitate knowledge exchange, collaboration, and networking among defense NPD stakeholders, including researchers, practitioners, policymakers, and industry leaders with focus towards supply chain also.

9. Foster Diversity and Inclusion: There is a need to promote diversity and inclusion in defense NPD research by supporting underrepresented groups and fostering a culture of inclusivity that values diverse perspectives and experiences and observe its impact on supply chain also.

10. Monitor and Evaluate Collaboration Impact: There must be a way to establish mechanisms to monitor and evaluate the impact of collaborative networks on knowledge production, innovation outcomes, and defense capabilities to ensure continuous improvement and alignment with strategic objectives and must align with the supply chain.

10. CONCLUSION:

In conclusion, this study not only sheds light on the landscape of defense NPD research but also underscores the significance of supply chain dynamics in shaping defense innovation. The findings reveal an increasing volume of publications in both defense NPD and supply chain studies, indicating a growing recognition of their interdependence. Emerging interdisciplinary trends highlight the integration of advanced technologies and agile supply chain practices in defense innovation. Key authors and influential works underscore the importance of collaborative networks across academia, industry, and government agencies. Recommendations include fostering closer partnerships, leveraging emerging technologies, and enhancing supply chain resilience to address evolving defense challenges effectively. By embracing interdisciplinary collaboration and adopting innovative supply chain strategies, the defense community can bolster its capabilities, enhance readiness, and adapt to emerging threats in an ever-changing global landscape.

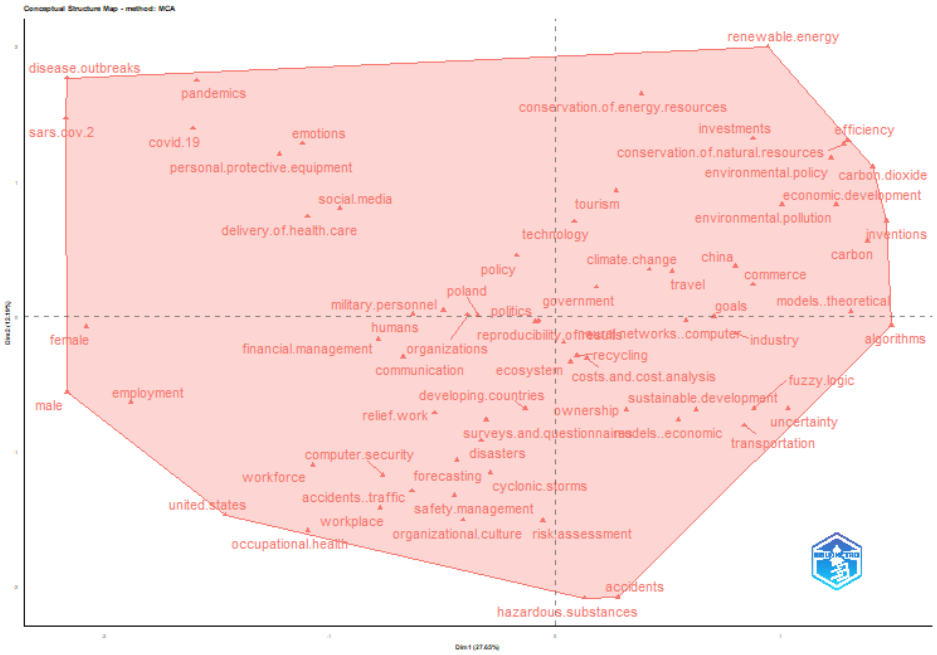
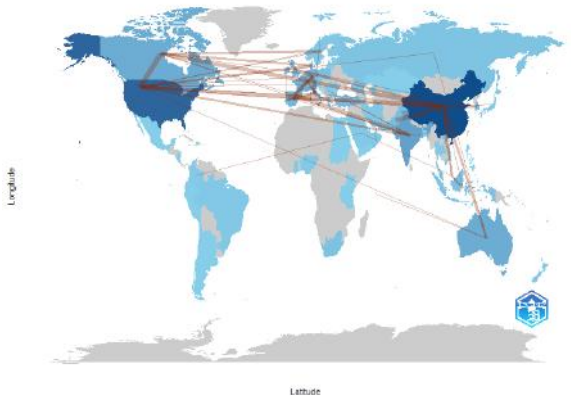


Figure 3:Conceptual Structural Map

(Aria & Cuccurullo, 2017)

Figure 4:Social Network-Collaborative World Map



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