

THE INTEGRAL ROLE OF RESEARCH AND DEVELOPMENT IN NAVAL FORCES AMIDST EMERGING AND DISRUPTIVE MILITARY TECHNOLOGIES

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ABSTRACT

This article presents a comprehensive strategic framework aimed at maximizing research and development (R & D) efforts within the Romanian Naval Forces. It outlines the qualitative aspects of the work, including the analysis of challenges and opportunities, the strategic objectives identified, and the partnerships established at national and NATO levels. The research method utilized involves synthesizing existing literature, analyzing defense policies, and examining case studies of multinational cooperation. The results indicate a clear roadmap for enhancing naval capabilities through collaborative R & D initiatives. The usefulness of this framework lies in its potential to address resource constraints, adapt to rapid technological evolution, and foster effective coordination and collaboration. By embracing innovation and strategic partnerships, the Romanian Naval Forces can position themselves for enhanced operational effectiveness and strategic autonomy.

KEYWORDS: research and development, capability development, technology, partnership

1. Introduction

The demand for scientific expertise, evidence-based advice, and technological innovation is growing for the Romanian Naval Forces. It is time for the Romanian Naval Forces to maximize the culture of cooperation to encourage the efficient use

of available resources. As new investments are made in national and NATO research and development, established framework programs for research and development collaboration help improve utility by sharing responsibilities and ensuring results that directly support the development of national

and NATO capabilities. Maximizing the impact of research-development and innovation on the Romanian Naval Forces requires the full scientific capacity, from each research and development unit to combat and logistic support forces, industry, and the academic environment.

Research in defense plays a pivotal role for nations prioritizing “strategic autonomy”. In a broader context, strategic autonomy refers to a political entity's capacity to independently engage in warfare at its discretion. Specifically, this autonomy encompasses three freedoms: the freedom to assess using the entity's own information sources (such as satellites and intelligence services), decision freedom involving planning and executing operations, and action freedom, which includes ensuring the security of the supply chain (McManus & Breen, 2023). Action freedom extends to the capability of independently producing, operating, deploying, maintaining, modifying, and eventually trading one's own weapons. As the development of cutting-edge weaponry systems relies on a mastery of science and technology, there exists a significant correlation between the latest technologies and the concept of “strategic autonomy”. Consequently, defense research becomes indispensable for achieving strategic autonomy, emphasizing the importance of technological studies as fundamental benchmarks, especially during budget constraints (Mauro & Thoma, 2016).

The field of military research and development encompasses a wide range of activities aimed at enhancing comprehension of future concepts, organizations, and equipment while showcasing their advantages. These activities encompass studies and analyses, participation in seminars and conferences, creation of expert papers, conducting systematic interviews with seasoned officers, engaging in war games, employing modeling and simulations, and undertaking field practice.

2. Strategic Approach

2.1. Objectives

Collective defense, crisis management, and cooperative security are the three fundamental duties that the Romanian Naval Forces must continue to fulfill. For military research, these essential duties lead to three strategic objectives. Although these strategic objectives are interconnected, each deserves distinct attention, as all three are equally relevant to the vision and mission of research and development in the Romanian Naval Forces.

2.1.1. Accelerating Capability Development

The process of enhancing military capabilities is exceptionally intricate, particularly when dealing with multilateral contexts, which adds a significant layer of complexity. Globally, armed forces have devised various models to navigate this complexity, each offering distinct solutions along with associated costs and benefits. However, a compromise is always present, primarily balancing political and coordination costs against economic and military advantages (Nemeth, 2022).

In the Romanian Naval Forces, research and development structures play a pivotal role in supporting capability development. They bring scientific knowledge and technological innovation to the forefront, contributing to the definition, development, demonstration, improvement, and cost reduction of capabilities. Simultaneously, these structures are instrumental in evaluating the sustainability, connectivity, and interoperability of defense and security capabilities. This positively impacts the armed forces by aligning with NATO defense planning priorities across short, medium, and long-term perspectives. It involves the identification and support of short-term technological insertions and the provision of insights for long-term capability development programs. Acceleration in this context is attained through early identification of pertinent technologies, conducting robust demonstrations,

and experimenting with advanced prototypes to facilitate swift transitions.

Capability development is not only about acquiring new weapon systems. Ensuring that a defense organization has the means to perform a task or produce an effect within specified performance standards and environmental conditions is another crucial aspect. Therefore, in addition to equipment acquisition, it is also necessary to allocate and train personnel, establish structures to provide a framework for specialists and equipment, build necessary facilities and infrastructure, ensure interoperability with allies, and develop conceptual and doctrinal support to provide guidance for action (Nemeth, 2022). Thus, military capability development is an extremely complex mission, as presented in Figure no. 1, often involving a large number of personnel from various fields.

The development of military capabilities is a protracted and arduous

undertaking, encompassing the cultivation of human capabilities through sustained, long-term efforts. Cultivating a cadre of elite scientific researchers capable of generating innovative concepts, skilled engineers adept at translating novel ideas into pragmatic technological solutions, and specialists possessing unique expertise demands a considerable investment of time and resources. Moreover, defense science and technology heavily rely on the existence of testing facilities and industrial installations, incurring substantial construction and maintenance expenses. These include but are not limited to wind tunnels, shipyards, advanced computing networks, microelectronics, and nanomaterials. In many respects, the ongoing process of defense research and development can be likened to the act of planting seeds – it is an extended and challenging process, with tangible results often requiring a significant duration to manifest.

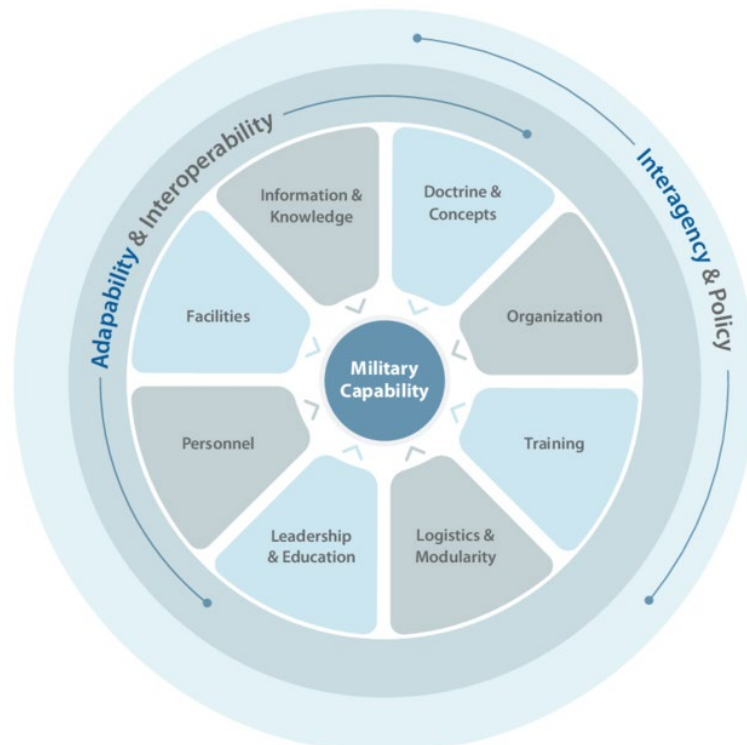


Figure no. 1: *Defense development lines, adapted from the Acquisition Manual of the United Kingdom Ministry of Defense, 2007*
(Source: Nemeth, 2022)

2.1.2. Providing Timely and Targeted Decision Support

Research and development units furnish prompt, evidence-based knowledge, analyses, and targeted advice either in response to beneficiary requests or through the active creation and refinement of appropriate tools. An illustration of this is operational research and analysis, which effectively contributes to the planning and decision-making processes across the entire spectrum of military activities. Effective decision-making support entails strategic communication to enhance the visibility of technological opportunities and threats, thereby heightening decision-makers' awareness of ongoing research and development activities.

Acquisition and investment decisions in capability development find support in research and development endeavors, encompassing activities such as delineating technological alternatives, establishing technical baselines, and pinpointing opportunities for technology insertion (Yue & Henshaw, 2009). The provision of pertinent data and analytical methods aids decision-makers by fostering close engagement and ensuring a clear comprehension of short and long-term requirements.

2.1.3. Capability Development through Collaborative Partnerships

The Romanian Naval Forces enhance capacity and contribute to decision-makers' consultation and partnership goals by conducting research and development cooperation activities between relevant institutions and partners from industry and academia. Strategic and technological interoperability is built through concentrated, continuous, and cooperative science and technology activities. The Romanian Naval Forces improve security dialogue, strengthen capacity, and mitigate threats by cultivating a competitive and reliable research and development community, even in situations where direct institutional dialogue is challenging.

There is an increasing demand from armies to work with allies and partners to develop high-quality capabilities, as they often lack the financial resources or specialized knowledge required to develop these capabilities themselves. However, managing financial and military deficiencies through multinational cooperation disproportionately increases project complexity. The increased complexity is due to defense organizations from different countries having to work together on multinational projects, each with its own organizational culture, objectives, structures, and different modes of operation. Thus, multinational working groups need to invest much more time and effort to coordinate their activities compared to projects carried out at the national level.

Despite these difficulties, military forces have devised and implemented new methods of operating and conducting multinational capability development projects. The different strategies used have different costs and benefits that decision-makers must weigh. A relevant example in this regard is the launch in November 2017 of the Permanent Structured Cooperation (PESCO) initiative (Zandee, 2018). This is a crucial development, as PESCO creates a mandatory framework of commitments made by participating member states, as provided for in Article 46 of the EU Treaty. As part of these commitments, participating member states undertake to collaborate with each other to create greater integration in the development and production of defense capabilities, improve their military capacity, and strengthen the European defense industry.

2.2. Partnerships

Research and development partnerships contribute significantly to the efficiency and effectiveness of the Romanian Naval Forces. These partnerships include collaboration with NATO, EU member states, industry, and academia. They ensure access to the most advanced technological

developments, enable the efficient sharing of resources, and leverage collective expertise. Research and development partnerships also facilitate interoperability with allied forces and enhance the Romanian Naval Forces' ability to contribute to NATO and EU missions and operations.

2.2.1. NATO Partnership

NATO's role in supporting the Romanian Naval Forces' research and development efforts is critical. The Alliance provides a platform for collaboration, information exchange, and joint initiatives among member states. NATO's Science and Technology Organization (STO) plays a key role in advancing defense science and technology, fostering cooperation, and promoting interoperability among member states. Research and development cooperation within NATO allows the Romanian Naval Forces to benefit from the expertise of other member states, access cutting-edge technologies, and contribute to the Alliance's collective defense capabilities.

2.2.2. EU Cooperation

In addition to NATO, the European Union (EU) is an essential partner for the Romanian Naval Forces' research and development activities. EU initiatives, such as the European Defence Fund (EDF), aim to enhance defense capabilities, stimulate research and innovation, and strengthen the European defense industrial base. Research and development cooperation with EU member states and participation in EU-funded projects provide opportunities for the Romanian Naval Forces to contribute to the development of common defense capabilities and ensure strategic autonomy.

2.2.3. Industry Collaboration

Collaboration with the defense industry is vital for the success of research and development initiatives. Industry partners bring expertise, technological capabilities,

and innovation to the table. Establishing effective communication channels, fostering long-term relationships, and engaging in collaborative projects with industry partners enhance the Romanian Naval Forces' ability to acquire cutting-edge technologies and develop state-of-the-art capabilities. Public-private partnerships and industry collaboration contribute to the sustainability and effectiveness of research and development efforts.

2.2.4. Academic Engagement

Engaging with academic institutions is a valuable aspect of research and development for the Romanian Naval Forces. Academic partners contribute to the scientific knowledge base, provide research capabilities, and offer a pool of skilled researchers. Collaboration with universities and research institutions ensures a continuous influx of new ideas, promotes academic-industry collaboration, and supports the development of a skilled workforce. Academic engagement contributes to the long-term success of research and development initiatives by fostering a culture of innovation and knowledge exchange.

3. Challenges and Opportunities

3.1. Challenges

While research and development play a critical role in enhancing the capabilities of the Romanian Naval Forces, there are several challenges that need to be addressed to maximize their impact.

3.1.1. Resource Constraints

One of the primary challenges is the limitation of resources, including financial, human, and infrastructural resources. Research and development activities require significant investments, and competing priorities may limit the allocation of resources to defense-related projects. Balancing the need for technological advancements with resource constraints is a complex task that requires strategic planning and prioritization.

3.1.2. Rapid Technological Evolution

The rapid pace of technological evolution poses a challenge for research and development efforts. Keeping up with emerging technologies, understanding their implications, and integrating them into military capabilities require continuous adaptation and agility. Failure to address the challenges of rapid technological evolution may result in outdated capabilities and diminished strategic advantage.

3.1.3. Coordination and Collaboration

Effective coordination and collaboration among various stakeholders, including military, government, industry, and academia, are essential for successful research and development. Overcoming differences in organizational cultures, aligning objectives, and establishing clear communication channels can be challenging. Streamlining collaboration processes and fostering a culture of partnership are critical for maximizing the impact of research and development activities.

3.1.4. Complex Multinational Projects

Participation in complex multinational projects, such as those within NATO or the EU, introduces additional challenges. Coordinating activities with multiple partner nations, managing diverse interests, and navigating complex bureaucratic processes require diplomatic skills and strategic planning. Finding common ground and ensuring equitable contributions from all partners are ongoing challenges in multinational research and development endeavors.

3.2. Opportunities

Despite the challenges, there are significant opportunities for the Romanian Naval Forces to enhance their capabilities through research and development.

3.2.1. Innovation Ecosystem

Fostering an innovation ecosystem that encourages collaboration between defense organizations, industry, and academia can unlock new opportunities. Creating

platforms for knowledge exchange, establishing innovation hubs, and incentivizing research and development partnerships contribute to the development of cutting-edge technologies. An agile and interconnected innovation ecosystem enables the Romanian Naval Forces to harness the collective expertise of various stakeholders.

3.2.2. Adaptive Training and Education

Investing in adaptive training and education programs ensures that military personnel and researchers are equipped to navigate the evolving technological landscape. Continuous learning, skill development, and exposure to emerging technologies empower the workforce to contribute effectively to research and development initiatives. Adaptive training and education programs create a dynamic and responsive environment that aligns with the fast-paced nature of technological advancements.

3.2.3. Strategic Prioritization

Strategic prioritization of research and development efforts based on national security objectives is crucial. Identifying key focus areas, setting clear objectives, and aligning research and development activities with strategic goals enhance the effectiveness of resource utilization. Strategic prioritization enables the Romanian Naval Forces to concentrate efforts on critical areas that directly contribute to their operational capabilities.

3.2.4. International Collaboration

International collaboration presents opportunities to leverage the strengths of partner nations, share the burden of research and development costs, and access a broader pool of expertise. Collaborating with NATO, EU member states, and industry partners facilitates the exchange of knowledge, promotes interoperability, and accelerates the development of advanced capabilities. Strategic international partnerships contribute to the resilience and effectiveness of research and development initiatives.

4. Conclusions

Research and development play a pivotal role in shaping the future capabilities of the Romanian Naval Forces. By strategically aligning research efforts with national security objectives, fostering collaboration within an innovation ecosystem, and actively participating in international partnerships, the Romanian Naval Forces can enhance their operational effectiveness and maintain a technological edge. Addressing challenges related to resource constraints, technological evolution, coordination, and collaboration requires proactive and adaptive approaches. Embracing opportunities such as the development of an innovation ecosystem, adaptive training and education, strategic prioritization, and international collaboration positions the Romanian Naval Forces to

navigate the complexities of the modern security landscape successfully.

As the Romanian Naval Forces continue to evolve and face emerging threats, a robust research and development framework will be essential to address dynamic challenges and capitalize on opportunities. By embracing innovation, building strategic partnerships, and prioritizing capabilities that align with future operational requirements, the Romanian Naval Forces can position themselves as a technologically advanced and adaptable naval force on the global stage. The commitment to research and development excellence will be a cornerstone in ensuring the readiness and effectiveness of the Romanian Naval Forces in the face of evolving security dynamics.

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