Defense Procurement and Innovation Dynamics: Changing Patterns and Policy Responses

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1. Motivation

Defence procurement is an archetypical case of Public Procurement for Innovation (PPI). Most industrialised countries have developed complex defence procurement systems to acquire defence systems with higher performance levels than their predecessors. During the Cold War the technologies developed through defence funding were at the forefront of technological development and are at the root of the technological systems that define our modern societies. Beyond the often contested rationale supporting the development of new defence systems in terms of their contribution to national security, the high investments in defence procurement have also been justified for their alleged contributions to development of new industrial capabilities in high technology sectors. Thus, specific procurement policies targeting the development and production of a new weapons system are linked to very broad strategic objectives addressing military, security and economic challenges.

Despite their scale and central role in the development of PPI, defence procurement policies have seldom been analyzed by innovation scholars. Their study has become the concern of a specialised group of analysts focusing on defence technologies, their development, and on the interaction between private and public agents in their development. This paper aims to provide a bridge between innovation scholars and defence procurement specialists by applying theoretical constructs derived from the analysis of innovation to the study of the role of defence procurement. It assesses how defence procurement is adapting to a transition between modes of technological accumulation, and the implications of these changes for future procurement policy.
2. Approach

The paper uses concepts developed in the broader field of innovation studies to analyse the role and evolution of defence procurement as a form of PPI. The paper argues that the structure and modes of functioning of innovation systems reflect the processes of creation, accumulation and use of knowledge. As the nature of these processes changes, the institutional and organizational approaches to innovation have to be re-evaluated.

We distinguish two different modes of technological accumulation (specific and generic), and shows how the defence procurement policies in the Cold War period responded to a model of specific accumulation. It then discusses the challenges that the transition to a dominant mode of generic accumulation poses to defence procurement policies and analyzes procurement reform in terms of the need for public policy to adapt to an emerging mode of "generic technological accumulation".

3. Expected results

The paper will show how the balance between specific and general modes of technological accumulation has affected the approaches to defence procurement. During the Cold War years technological accumulation occurred along the developmental paths of particular artefacts (such as aircraft). The selection, codification and organisation of knowledge were therefore guided by particular needs and were highly specific. In defence procurement this situation translated into a complex organisational structure oriented to the development of new defence systems; the defence research and technology system was vertically integrated with the development of component technologies being funded by defence customers to support specific systems. Defence firms were highly specialised, and customers could influence the characteristics of the technologies they required down to component level.

The paper will show how this mode of technological accumulation has transitioned during recent decades to a new system characterised by a rapid expansion of generic capabilities that create technological commonalities across seemingly unrelated innovation domains. We will argue that recent transformations in the defence sector may be ascribed more to the pressures operating in all high-technology industries than to the end of the Cold War per se: the mode of general accumulation occurs across diverse domains and is creating the stock of knowledge and capabilities common to a wide range of applications. It is this form of accumulation that gives rise to an open 'design space'. Its enlargement and evolution account for the growth of generic capabilities: technologies that in the past evolved independently of one another share today increasingly similar knowledge bases. Technical elements with the greatest generic potential will diffuse and evolve more rapidly than the highly specific or idiosyncratic ones. We will argue that these processes are greatly enhanced by the ubiquitous presence of information technologies.
Defence procurement, and therefore the use of Public Procurement for Innovation has had to adapt to these changes. As ICT gained ground as a horizontal technology, contributing to general technological accumulation, the high volume and the diversity of ICT applications became key drivers of the new technology dynamic. Defence applications and systems were no longer driving this technological dynamic. Procurement practices have had to adapt to allow for a loosening vertical ties among defence suppliers: suppliers of basic capabilities (tools, materials, components, R&D services, etc.) escape their captive status within vertically integrated firms and industries to form new industries responding to diverse markets. The integrator firms shed the weight of basic technology development, which is inherently risky and difficult to exploit commercially, and this development is taken over by entrepreneurial start-ups and other commercially nimble specialist firms. This development does require, however a profound change in procurement policy.

4. Policy implications

As the importance of lateral linkages increases, the defence research system becomes, at least potentially, co-extensive with the entire innovation system. The relationships between defence customers and their suppliers change and adopt a new configuration. This change is particularly daunting for Europe. The blurring of the civil-security-defence boundary appears to be breaking up formerly closed defence R&D policy networks. Yet, the institutional setup that grew during the Cold War within a model of specific accumulation can only change slowly. The paper will argue that while there will be growing commonalities between defence and civilian sectors at the technological and functional level, important institutional divisions will persist posing intricate policy problems. The paper will review four sets of emerging policy responses to the changing knowledge dynamics and the challenges they generate:

1. Defence technology strategies are being developed to seek access and influence civil origin technologies and technological capabilities, and to exploit in different environments the results of the investments made in defence R&D.
2. In an environment in which the knowledge that is required is diverse and its sources widespread, "dynamic capabilities" including monitoring, absorption, and integrative capacity are of key importance. An answer is the development of policies to improve connectivity with broader systems of innovation, opening up, for instance, defence research establishments to new markets and activities. The specific measures vary across countries but typically seek to increase managerial flexibility through the promotion of commercial practices. The result is increased diversity in the client and activity portfolio of these establishments, opening possibilities for the exploitation of their capacities in civilian markets, and increasing their ability to absorb and integrate technologies developed elsewhere.
3. Some countries are seeking to promote synergies between defence and security research.
4. The generic character of many security and defence related technologies, the diversity of locations in the innovation systems at which knowledge critical to the development of these technologies is created, and the new security environment have had significant consequences for the governance of technology. New approaches to regulate "dangerous knowledge" are being implemented. In the US, for instance, new laws such as the USA PATRIOT Act and tougher enforcement of existing regulations have generated a new regulatory environment effecting scientific research and higher education.