

MILITARY PROCUREMENT AND TECHNOLOGICAL CHANGE

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Summary

Military organizations have relied on technologies throughout recorded history. With industrialization, the relationship between procurement and technology changed in important respects. In the nineteenth and twentieth centuries, military organizations drew resources from more productive industrialized societies. This fusion of industrialism and warfare made it possible to coordinate much larger military forces, over large distances and for prolonged periods. As a consequence, warfare became more lethal for soldiers and civilians. The reliance on state-of-the-art technologies led the military to invest in and to influence the path of technological and economic development. In the middle decades of the twentieth century, military-industrial complexes were built and maintained by leading military powers. At the dawn of the twenty-first century, militarism is being pursued while placing smaller demands on overall economic resources. Although the emphasis on cutting edge technologies is maintained, contemporary military organizations are relying on commercial firms for technological innovation, and the military is reducing its reliance on defense-oriented laboratories and factories. The smaller footprint of contemporary military organizations should not obscure the continuing danger of militarism. In fact, the development of science- and capital-intensive armed forces makes possible "spectator sport wars" in which the citizenry of affluent nations watch wars unfold in much the same manner that fans watch sporting events. However, for those living in nations with weaker and technologically inferior armed forces, war continues to be deadly and destructive.

1. Introduction

This essay examines the relationship between procurement and technological

development. In addressing this topic, the emphasis is on developments in leading military powers of recent centuries, especially the United States. An historical emphasis has been adopted to make the point that there is *not* a law-like relationship between military procurement and technological change. Rather, this relationship is a contingent one that is influenced by several factors: the growth and transformation of domestic political institutions; changes in the interstate system of diplomacy and war; military organization, strategy and tactics; and economic and technological development. This essay examines the relationship between military procurement and technological change in three eras: (a) the fusion of militarism and industrialism, 1830-1914; (b) the era of the military-industrial complex, 1914-1970; and (c) the military procurement in a post-industrial era, 1970-present. Military leaders attempted to shape technological development long before the Industrial Revolution, and they met with some successes. However, before industrialization transformed war making, the dominant pattern was for the military to rely on existing civilian technologies to transport, feed, and communicate with their troops. Even swords, bows, guns, and ammunition were typically fabricated through metallurgical and chemical processes that were quite similar to those used in civilian industries. While military orders and requirements clearly spurred and subsidized technological change, the impact of military procurement on technological development was modest. In this sense, military power was largely dependent on the ability of the state to extract resources from society—including civilian technologies. In the wake of the Industrial Revolution, the quest for military power has spurred the development and deployment of specifically military technologies. The mass industrial wars of the twentieth century reinforced the relationship between technological innovation and warfare. During the era of the military-industrial complex (1914-70), the military placed heavy demands on the entire economy and procurement propelled and guided technological development. Finally, in the current period (1970 - present), the industrial content of military procurement has declined while the emphasis on sophisticated technologies has mounted. In the United States, military procurement places growing emphasis on technological advance, and in this sense, procurement facilitates and relies on technological change. For products with a uniquely military purpose (nuclear weapons, military vehicles, explosives, biological and chemical weapons, etc.), military agencies direct and guide ambitious research and development efforts. At the same time, military organizations currently exert less influence over basic scientific research and are increasingly reliant on technological advances developed in non-military endeavors.

2. The Fusion of Militarism and Industrialism, 1830-1914

In his book, *The Pursuit of Power*, William McNeill provides an overview of military mobilizations over many centuries. He dates the fusion of militarism and industrialism to 1840, shortly after the Industrial Revolution transformed economic activity. The Industrial Revolution was neither set in motion by military procurement, nor did military leaders control it. However, as industrialization gained momentum in Europe and North America, military leaders quickly recognized the threats and exploited the opportunities. During this period, military strategies and tactics were influenced by technological developments that occurred beyond the control of military organizations. Martin van Creveld's *Technology and War* offers a very useful and thorough examination of the manner in which technologies have been harnessed to wage war.

Before industrialization, the largest military forces were less than a million troops and battlefields extended over several kilometers at most. As industrialization progressed, military leaders harnessed new sources of energy to transport (i.e. steam-powered trains and ships) and communicate (i.e. the telegraph) with troops. These improvements enabled military leaders to deploy millions of troops across battle lines many kilometers in width. These improvements in logistics did not require a distinctly militarized industrial sector, nor did they lead to a militarization of industrial production during peacetime.

The U.S. Civil War was one of the first conflicts to reflect the industrialization of war making. The North and even the less industrialized South sent millions of troops to frontlines that spanned nearly half of the North American continent and kept these large armies supplied with food and fiber for many months. On the land, the North and South supplied troops with arms of unprecedented quality and with abundant ammunition. The consequence was a sustained slaughter for several years and a casualty rate that surpassed all previous wars. When compared to the horrors of twentieth century wars it is easy to lose sight of the bloodiness of this Civil War. For contemporaries, the Civil War was surprisingly destructive and violent, its dynamics unprecedented. The Civil War's remarkable violence was not due to the development of new military technologies. Rather, Civil War logistics were oriented toward the procurement of existing goods to supply and transport troops in the field. Nevertheless, this war foreshadowed the development of technologies of a distinctly military origin and use. Both the North and South deployed (in small numbers) "ironclad" warships that could only be used for war. These steam-powered ships were wrapped in iron and quite compromised for transport. However, these warships were not harmed by existing cannons and attacked wooden sailing ships with impunity.

The Crimean War (1854-56) and the Prussian success against Austria (1866) and France (1870-71) also highlight the manner in which technological change and industrialization transformed war. While the artillery, rifles, and ammunition employed in the Crimean War displayed modest improvements, major innovations occurred in logistics. France and Britain took advantage of improved water-borne transportation to supply its forces in the Black Sea. However, due to the underdevelopment of the Russian overland transportation (i.e. bad roads and few railroads), Russian troops on the northern shore of the Black Sea lacked munitions to fend off the British and French. As a consequence, a small expeditionary force defeated Russian troops fighting on their home soil. The Prussian military was quick to adapt its military strategy to accommodate industrial innovation. In its Austrian campaign (1866), Prussia used trains to facilitate its advance and strung telegraph wire to maintain communication with its advancing forces. While the communication was quite limited and far from secure, the Prussian high command could maintain unprecedented coordination over a large and dispersed force during this campaign. As in the American Civil War, the European military of the nineteenth century did not dictate the pace and content of technological change—but military tactics and strategy were transformed by the ability of industrialized economies to produce munitions and by the technological advances occurring in civilian sectors.

By exploiting the fruits of industrialization, European and North American military forces were at a decided advantage when confronting less industrialized societies. Adam

Smith was among the first to recognize the threat that Europe's accumulating economic advantages posed to lesser developed nations: In modern war the great expense of firearms gives an evident advantage to the nation which can best afford that expense; and consequently to an opulent and civilized over a poor and barbarous nation. In ancient times the opulent and civilized found it difficult to defend themselves against poor and barbarous nations. In modern times the poor and barbarous nations find it difficult to defend themselves against the opulent and civilized.

As Smith anticipated, the leap in logistics and firepower made possible by industrialism accelerated imperial conquest in the nineteenth century. A similar dynamic was at work in the United States. The editors of *Fortune* pointed out that between 1776 and 1935, the U.S. "filched more square miles of the earth by sheer military conquest than any army in the world, except only that of Great Britain. And as between Great Britain and the U.S. it has been a close race, Britain having conquered something over 3 500 000 square miles since that date, and the U.S. (if one includes wresting the Louisiana Purchase from the Indians) something over 3 100 000". Surprisingly, the United States conquered the North American continent with a small professional army and modest defense spending. Settlers and loosely organized militias led this conquest. The demographic and technological advantages enjoyed by European settlers in the nineteenth century enabled the United States to conquer much of the North American continent without creating a large and professionalized standing army.

One of the distinctive features of industrialized war making was the emergence of arms races. The first industrialized arms race occurred in the decades preceding World War I and pitted the United Kingdom against Germany. An unprecedented portion of each nation's national product was diverted to the development and deployment of spectacular weapons. The profits and employment provided by the arms race politicized military procurement. In turn, glamorous and technologically innovative firms grew dramatically by virtue of this arms race (Krupps in Germany and Vickers and Elswick in the United Kingdom). This pre-World War I arms race foreshadowed many of the dynamics that would characterize the industrialized warfare of the twentieth century. This competition took the form of a naval arms race in which these nations competed to make battleships that were larger, protected by more effective armor, and equipped with more formidable weapons. These ships were only useful for military activities and they incorporated technologies that were far too expensive and/or not useful for commercial ships. In this sense, industrialism also gave rise to the "invention of invention"—developing uniquely military end-items and maintaining large industrial concerns (including defense firms and state-owned armories and shipyards) to produce them.

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Biographical Sketch

Gregory Hooks is Professor and Chair of the Department of Sociology, Washington State University. In 1985, he received his Ph.D. in Sociology at the University of Wisconsin-Madison. Hooks has examined militarism throughout his career, with an emphasis on the economic growth and social consequences of the defense program in the United States. He has examined these issues in his book, *Forging the Military-Industrial Complex* and dozens of articles. His work has appeared in leading sociological

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