Close Partners: The Adoption of Industry Management Procedures by the Department of Defense

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Two separate and independent strands of thinking have come together to produce this paper. The first is my interest in the historical roots of defense management and particularly the acquisition of major weapons systems, which I view as a unique and even unprecedented undertaking. This led to a search for similar or related studies, which I unfortunately found to be scarce.

The work of Louis Galambos, Brian Balogh, Samuel Hays and others is, however, suggestive of a new approach to my interest and this provided the second strand. Louis Galambos argues that there has been an "integrative and even symbiotic" relationship between the federal bureaucracy and corporate America [12, p.10]. In addition, Hays points out that despite interesting similarities between the two, such as the growth experienced by both at the end of the nineteenth century, historians have tended to treat them separately [16, p. 22].

These ideas, combined with my interests, led to a search for a way to illuminate the relationship between the Department of Defense and the business community, as it pertained to acquisition. It was recognized, however, that such a study has special difficulties. Most importantly, acquisition is a highly visible operation which is and has been the focus of intense political activity. This has led to a detailed scrutiny of it, which has frequently been accompanied by a high rate of regulation and micromanagement, which tends to distort the process.

It was felt, however, that with a certain degree of caution, it would nonetheless be possible to use acquisition as a means of examining the relationship between the defense industry and the department. This could be accomplished by making a conscious effort to identify and exclude politically mandated activities and to concentrate instead on those which are inherent to the historical evolution of the acquisition process. This would make it possible to answer questions focused on the interchange between the two communities. For instance, were the department and business "close partners" in the

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evolution of management practices and procedures related to acquisition, as suggested by Louis Galambos? Or is there perhaps a better way to define the relationship?

I chose to concentrate on specific examples of pertinent innovation adopted by the Department of Defense, with the intent of determining their origins. Any evidence pointing toward an exchange of concepts and techniques would help to confirm the existence of the suggested symbiosis. This presentation is divided into three sections. A brief introductory and historical background is followed by the main argument related to specific innovations and a concluding section.

The Department of Defense and Its Suppliers

The relationship between the Department of Defense and its suppliers, as well as the public perception of the defense industry, is somewhat ambivalent. Variously characterized as "merchants of death" in the 1930s or, pejoratively, as the "military-industrial complex" in the 1960s, the same group was also known as the "arsenal of democracy" during World War II.

Government attitudes echo this ambivalence. Those involved in defense acquisition, for instance, are often chided for what is termed a "confrontational attitude" toward suppliers. On the other hand, government executives frequently encourage the adoption of business practices. In 1877, for instance, President Rutherford Hayes ordered the reorganization of the scandal-ridden custom houses on "a strictly business basis" with the same checks and balances "required by a prudent merchant" [15]. And, in 1986, the Packard Commission used the "most successful industrial companies" [26, p. 52] as a model to emulate in improving defense acquisition.

There are many historical examples of specific exchanges between the military bureaucracy and its suppliers. Eli Whitney's work at the Springfield Armory [1, pp. 57ff], where he introduced an early form of mass production, has been credited with making a significant contribution toward the later evolution of scientific factory management [18, p. 393; 6, pp. 74-5]. In addition, an Army officer pioneered in cost accounting during this same period [1, p. 72].

The Navy experience in the nineteenth century was somewhat different. A true technological revolution occurred in shipbuilding, as the transformation from wooden to steel construction and from wind to steam propulsion took place. The result of those changes, "the gigantic, expensive, steel-plated, steam-propelled, heavily armed and armored warship" [29, p. 54], may have been the first genuine "weapon systems" and shipbuilding may, in reality, have represented the earliest experience in what we have come to term acquisition management. However, the Navy technological revolution was not accompanied by corresponding changes in the Navy's traditional acquisition organization, which seems to indicate no change in management procedures. The relevance of that experience to the mid-twentieth century developments outlined below, however, has not been fully explored and awaits further investigation.

A principal point of contact between the military, primarily the Army, and the business community was the railroads. One result of this contact may well have been the pioneering adoption of what resembles a military line (operational) and staff (management, financial, etc.) organization by the Baltimore and Ohio Railroad. Alfred Chandler argues that this was merely a "rational, analytical" response to "immediate and pressing operational problems requiring the organization of men and machinery" [5, p.p. 120, 95]. Another historian, however, maintains that the railroad managers were dealing with problems the solutions of which had already been worked out in other large organizations, such as armies [1, p. 18].

Regardless of which position you take, it is still clear that an extensive interchange between the military and the business community did occur during the nineteenth century. This practice tended to continue into the twentieth century. One way used by the government to access private sector innovation was through the appointment of business executives to key governmental jobs, such as the dollar-a-year men of World War II [10]. Truman, for instance, called in the president of Chrysler to "knock heads together whenever it was necessary" [3, p. 124] to straighten out what was perceived as a foundering Department of Defense missile program.

Several Secretaries of Defense had close and even intimate connections to the business community. Charles Wilson was a former General Motors president and was reportedly chosen specifically for that experience [2, p. 74]. And Robert McNamara, also an auto executive, may have been the culmination of the tendency. In those executives more directly related to acquisition, the most striking example of potential business input is in the Under Secretaries of Acquisition, where all four of the officeholders have been former business executives.

The Department of Defense and its related business community have therefore experienced a long history of interchange and exchange, beginning at least as early as the nineteenth century and continuing to the present. One way to determine the effect of this relationship is to examine specific departmental activities to identify evidence of any influence exerted.

This paper examines three innovations related to the acquisition of major weapon systems, focusing on connections between them and the larger business community. The innovations chosen for study are:

- The Weapons Systems Management concept, variously referred to as project, program, or system management.
- The introduction of the Planning, Programming and Budgeting System. (PPBS).
- Weapons Systems (or just Systems) Analysis.

The Weapon Systems Management Concept

This was the pre-eminent development and involved specific management, but also conceptual changes. A variety of factors present at the end of World War II contributed to its emergence, but technological advances

were primary. They made the new weapons far more complex and costly and forced a shift in thinking.

The new weapons soon were envisioned as "systems" - a "total entity ... with all supporting facilities" [34, p. 195]. Since they commanded a much larger share of available resources, they forced the formation of new organizational alignments and management techniques to assist in maintaining control over their development. The solution arrived at was to establish a specific focal point for the new systems - a project office - and to locate it outside of the normal organizational alignment, and to set up special, unique procedures for its management.

Considering the reasons for the development of the weapons system management concept, it is not at all surprising that the leaders in this innovation were the Air Force and Navy. The Air Force, in particular, was deeply involved in the post-WWII technological revolution, and, when the submarine launched ballistics missile became feasible, the Navy joined them.

In addition to its technological involvement, the Air Force had experience in previous projects which mirrored some of the new developments. They were familiar with the Manhattan Project, and even more intimately, with the B-29 program [9, p. 33]. Building on this, in 1951, the Air Force issued Air Force Regulation 20-10 which recognized the need for Weapon System Project Offices in certain instances [14, p. 28]. The final culmination of the early Air Force experience was the 1954 establishment of the Special Aircraft Project Office (SAPO). Created to ramrod the Titan ICBM missile effort, the SAPO is generally acknowledged to be the first implementation of the Weapons Systems Management Concept. The Navy followed with its Polaris program. They first experimented with coordination through the appointment of a lead bureau but this proved ineffective [32, pp. 60-1], and the Polaris Special Project Office was therefore established in 1955.

Both SAPO and the Polaris project office brought together in one place and under one manager what had formerly been dispersed functions related to what were now referred to as "weapon systems" [18, pp. 401-2]. Design, procurement, production, and even funding were all handled through the project office. One observer noted that this "... literally invert<ed> the materiel command's organizational structure, making functional managers (buying, supply, maintenance, transportation) subordinate to product management rather than the reverse" [9, p. 60]. Or, as another commentator noted, project offices did not fit into traditional horizontal and vertical organizations, but were outside and separate from them [11, pp. 89-90].

Once the organizational realignment was accomplished, new operating procedures were set into place. The Air Force adopted shortened reporting procedures bypassing former required command lines [9, p. 41]. In addition, the Polaris project leader had control over whatever financial and technical resources he needed [30, p. 203], extending even to the choice of any officers he desired [32, p. 71.]. Response to the new idea was quick. A 1955 Department of Defense committee recognized its significance and recommended that senior military officers who had control of all resources related to the system should be in charge of the office, and that the office should "be elevated in the command organizational structure" [9, pp. 59-60].

There were, however, problems. Despite the growth in number of Navy project offices, - from two in 1963 to 28 in 1965 [32, pp. 61-63] - only the Polaris office retained the breadth of authority which the concept required [30, p. 199]. In addition, by 1959, just four years after the adoption of shortened reporting lines, the Air Force reversed the practice and began to add reporting procedures to the ICBM program office [27, p. 9]. Despite the institutional resistance to the concept, it was nonetheless implemented and remains a keystone of defense acquisition.

There was a quick reaction within the business community as related articles and books began appearing in the early 1960s [18, pp. 23-48]. This was followed by a significant exchange of ideas related to project management. The Navy had developed the Program Evaluation and Review Technique (PERT) reporting procedure [30], which was picked up and used extensively in industry, while Line of Balance and Critical Path Methods were industry developments used by military project management [20].

This first innovation appears therefore to have taken place within the military bureaucracy. Shortly afterward, however, it spread to the business community, resulting in a significant and continuing exchange of related ideas and techniques.

Planning, Programming and Budgeting System (PPBS)

PPBS is the principal financial management and reporting system within the department and its key feature is program budgeting. The basic premise of program budgeting is the bringing together of disparate expenses related to a specific goal into one account. It replaced a system which accounted for Air Force bombers, as an example, in an Air Force procurement account separate from related support expenses. This made it extremely difficult, if not impossible, to determine how much money was being spent on the B-52, for instance, or at a more macro level for the entire departmental strategic mission. Under the PPBS, a Strategic Retaliatory Force account included Air Force bombers, Navy submarines, and all service missiles as well as the manpower and facilities related to their procurement, maintenance, etc.

The adoption of PPBS was therefore a major innovation. The origins of it, however, lie outside of the department. The DuPont Chemical Company and General Motors introduced program budgeting and by 1926 General Motors had a fully working program budget. GM's system included, among other things, a continuous five year planning projection which outlined various alternatives based on market conditions, competition, etc [23, p. 2].

The transition of the concept from industry to the government was somewhat tortuous. President Taft's Commission on Economy and Efficiency had recommended program categories as early as 1912, but this was a bit premature since a coordinated federal budget, with all agencies submitting at one time, was not adopted until 1921. In addition, both post-World War II Hoover Commissions also recommended its use [31, pp. 7-8].

David Novick, the RAND analyst credited with the introduction of PPBS, also reports that he was aware of a form of program budgeting being

used by the War Production Board in 1942 [23, pp. 3-5]. When an Air Force officer asked him to help in the establishment of a new expense accounting system in 1951, he drew on this experience. The end result was the publication of *Efficiency and Economy in Government Through New Budgeting and Accounting Procedures* in 1954.

Novick's recommendations were not immediately accepted however and, using his words, they met with "something less than complete enthusiasm." Novick and RAND kept pursuing the matter and eventually briefed it to members of the incoming Kennedy administration [23, pp. 6-7], and it was introduced into the Department of Defense by Secretary of Defense McNamara in 1961.

The initial introduction of PPBS into the department may have resulted not only from a desire to improve management but also from political motivations. The immediate effects, for instance, were political, since the position of the Secretary of Defense and his Office (OSD) relative to that of the military departments was considerably strengthened. Charles Hitch, the Comptroller who set up the original system noted this, saying "For the first time the Secretary of Defense is capable of exercising the authority given him in the National Security Act of 1947 ..."[35, p. 15]. Within a few years, however, the military had developed their own capability to offset the increased power afforded to the Secretary [19, p. 33]. Today's PPBS is undoubtedly used politically, but it is also unarguably one of the major management systems in the department.

The PPBS used in the Department of Defense apparently developed without any direct input from the business community. Novick acknowledged his connection with the War Production Board and also reported a visit from a retired GM executive who presented him with a copy of a GM program budget. This visit, however, occurred in 1959, which was four years after the publication of Novick's original paper [23, pp. 1-2].

Program budgeting, therefore, apparently originated within the business sector, but the government adaptation of it occurred separately, largely at the instigation of David Novick. There was, however, some indirect input due to Novick's experience with a related system during WWII, perhaps under one of the dollar-a-year men, who could have been familiar with GM's procedures.

Systems Analysis

The adoption of Systems Analysis was in many ways related to PPBS. Program budgeting provided the ability to portray aggregate costs related to a given goal. Systems analysis supplemented this by providing a way to measure and compare the cost of alternative means to accomplish a given goal.

Systems analysis - like PPBS - had been around for a long time before it was adopted for governmental use. The first formal exposition of related techniques dates back as far as 1887, and both the Army Corps of Engineers and Bell Laboratories did related work during the 1920s and 1930s [28, pp. 7-8; 23, p. 9]. Formal weapon systems analysis, although similar to some of

these earlier techniques, is, however, more directly related to World War II operations research [18, p. 399-400; 28, p. 11; 24, p. 9].

The critical period for its development was the 1950s when RAND mathematicians and economists formulated a new concept that drew on the previous methods and techniques but introduced a new wrinkle. They devised a way to measure social, political, and economic factors so that demands on national economies, for instance, could be added to the analysis [23]. This coming together of strands of operational research, economic theory, and engineering resulted in the weapons systems analysis which is practiced today.

After the methodology had been developed, RAND analysts briefed Robert McNamara and McNamara, an operational researcher himself, accepted it for use within the Department of Defense [17, pp. 7-8]. In 1965, President Lyndon Johnson installed PPBS throughout the federal government and the Bureau of Budget directed each department to prepare similar analyses before budget approval [28, p. 13].

The adoption of the concept did not, however, mean that it was easily implemented. Within the Department of Defense, for example, it met with strong resistance. Arguments similar to this by a military man were common: "A war, small or large, does not follow a prescribed 'scenario' laid out in advance. If we could predict the sequence of events accurately, we could probably avoid the war in the first place" [35, p. 39]. Some members of Congress were also opposed to it as illustrated by what I have dubbed the "infamous Marine khaki pants shortage."

Representative Flood, clearly enjoyed questioning one hapless systems analyst about the decision to cut a request for clothing by the Marines just when a fifth division had been authorized. When asked how this had happened, the analyst rather lamely replied, "The OSD analyst felt the stocks on hand were adequate to meet the situation." The Congressman then lectured the representative with obvious relish about the limitations and failures of analysis. He pointed out that it was his experience after many years in the Congress that the Marines ran on a "tight budget": "I have sat here and dozens of members have sat here and pleaded with them, 'Don't you want some more money, General, Commandant?..He says, 'No.'". He then added, "You ought to know it in Defense like we know here, when the Marines come in and ask for an x number of pairs of pants, they mean that number." And, ending with an especially grandiose flourish: "The Marines can fight in shorts if they have to, but there should be no reason for it" [33, p. 608-650].

The evidence indicates therefore that systems analysis, just as PPBS, developed independently of any business input. Indeed, proprietary and competition concerns may have created barriers to the transfer of related information. The fact that for a time there were separate professional societies for business and government cost analysts may be an indication of this [17, p. 20].

Conclusion

This paper first outlined the significant exchange of ideas between business and the military services which occurred in the nineteenth century. It then examined three examples of management innovation in the post-1945 Department of Defense which illustrated a continuation, but also a subtle alteration, of this practice.

The short history of nineteenth century developments outlined a great deal of interplay between the two communities. The Army Ordnance Department invited in outside consultants - Eli Whitney in 1815, Frederick Taylor towards the end of the century - and apparently adopted their suggestions with ease. This led to the transmission of the ideas of interchangeable component production and scientific management from the business community to at least the Army.

There also seems to have been a great deal of similar activity between the military - primarily the Army - and the railroads. Pioneering work in cost accounting was done by a military man and was adopted by the railroads as was the concept of line and staff organization and operation.

The evidence concerning the Navy is less conclusive. This paper only noted that the Navy went through a technological revolution that required extensive operational and philosophical rethinking. The role of business here is not clear and awaits further investigation.

Leaving these early manifestations of what appear to be rather extensive exchanges between the two communities, we then examined three examples of management innovation in the Department of Defense. The first was the Weapon Systems Management concept which is the underpinning of all modern acquisition practices. This was shown to have developed within the military services, largely in response to the post World War II technological revolution. There did not appear to be any input from the business community.

There was, however, a flowing outward from the department to the community in connection with the Weapon Systems Management Concept. Nearly all of the sources examined for this study noted that involved contractors soon developed organizational, procedural and management systems which paralleled those of the department [32, p. 67-8; 18, p. 31]. Early ideas concerning the phases of system developments were picked up and appeared in the business literature beginning around 1960 [18, p. 398; 12, p. 96]. In addition, there was and continues to be a significant exchange of ideas related to improvements in the concept.

There are different conclusions in connection with both PPBS and systems analysis. In both cases, it appears that the techniques and concepts originated in industry. However, there was a separate and apparently independent development which led to their adoption by the Department of Defense.

In the case of PPBS, General Motors had been using a similar system for almost forty years before Robert McNamara initiated it in the Department of Defense. In addition, cost analysis techniques had been developed, perhaps as early as 80, but at least 40 years earlier. There appears, however, to have

been no direct transition from one to the other but rather, in both cases, analysts from the RAND Corporation were instrumental in their introduction into the department.

There are therefore two conclusions to be reached from this study. First, there has been and continues to be significant, mutual interchange and transmission of ideas between the federal military bureaucracy and the business community. There has been a change in the nature of this interchange in the modern (post-World War II period) as techniques and concepts already existing in the business community have been adopted into the Department of Defense only after a separate and independent development.

A more general conclusion is that the long-term relationship between the federal military bureaucracy and the business community can indeed be characterized as "close partners" or "integrative and symbiotic." More recently, however, the trend seems to be towards a continuing of the outward flow from the military departments to the community, accompanied by a tempered or somewhat obstructed flow inward.

It is difficult to tell if this last is a temporary phenomenon or something more permanent. What it does indicate is that the relationship between the federal bureaucracy and corporate America, as Samuel Hays has indicated, requires more attention than has previously been provided by the academic community.

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