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DEVELOPING AN URBAN-INDUSTRIAL COMPLEX: THE DEMONSTRATION SALE CONTRACT

The cities need help. The technology is there to do the job. The technological community has the knowhow to make the necessary adaptations, and industry is willing to provide it if it can make a profit. But the barriers between the three segments involved are formidable.

—The Struggle to Bring Technology to Cities Urban Institute, 1971

There is ample evidence that the solution of our existing social problems depends far less on the development of new technology than it does on the implementation of existing technology.

Technology with which to make social progress in housing, mass transit, health care, environment, and education may exist in abundance. But nothing will happen unless this technology is applied to specific problems in ways that will turn state and local government into interested buyers.

Selling to state and local government poses special problems. In the first place, these government entities have little disposable income. For the most part, social advances have to be "profitable;" they must pay for themselves.

In the second place, evidence that the project will be profitable must be sufficiently clear to persuade many different observers: city managers, advisory committees, local press, citizen groups, and so on. This requires a difficult selling campaign, and it requires, above all, demonstrations that the project has succeeded before.

Third, different cities may want different programs suiting their special needs. Often there is no way of aggregating the market for a new development because many potential buyers want something slightly different.

Poverty, Politics and Preferences

In short, selling technology to state and local government requires the seller to cope with poverty, politics, and preferences. These pose much more difficult obstacles to social progress than the abstract R&D required to make an advance "technically possible."

Consider, by way of contrast, the structure of technical progress within the military-industrial complex. In the first place, there is a single buyer (DOD) and it has been anything but poor. Often, its slogan has been "money is no object." In the second place, the monolithic structure of the Defense Department—with a Secretary of Defense and pyramidal decision making—simplified the politics of selling. In the third place the problem of varying tastes was replaced with the "specifications" of that single unique buyer—specifications with which the seller could try to make his project comply.

Defense industry has learned how to function in this environment. It has hired the retired military officers who know the ropes, learned how to handle contracts with specifications, learned how to exploit Defense Department attitudes toward cost-overruns, and all the rest. The result has been that symbiotic relationship we know as the military-industrial complex—a close cooperative arrangement in which many defense suppliers have come to find a role in supplying the needs of a single enormous purchaser.

Real social progress will require a comparable relationship between the suppliers of socially useful goods, and the many different state and local governmental entities that can make use of them. Federal efforts should encourage that relationship.

Three Government Approaches

There are three possible approaches to this general problem which the Federal Government might adopt. In the first place, it might deny the problem. It might fund R&D projects that seemed likely to be useful, confidently assuming that the firms undertaking an advance will certainly try to sell it to some user. But this assumption is not really warranted. Some firms may see their role simply as one of performing development contracts. Even if they intend, in some general sense, to explore the market later, the primary effort of these firms may be devoted to fulfilling the development contract, without urgent efforts to assure that the project does fill a felt need of an urban bureaucracy. For example, such a firm may never hire a serious sales force. Unwarranted optimism may then give way to exaggerated pessimism.

A second approach for the Federal Government is one of trying to eliminate the problem of diverse buyers. Proponents of this point of view suggest that the Federal Government investigate a particular need and abstract, for the benefit of industry, what the specifications of a solution might be. The Federal Government could then let a contract to industry which outlined those specifications and hope that the fulfillment of the specifications will indeed find a useful market as projected. While this may work sometimes, it has disadvantages. In the first place, it may not be possible to satisfy different tastes with the

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same set of specifications. Second, the Federal Government may not be especially good at estimating what those tastes are—in particular, it does not have the concern to be right that the profit motive can instill. Perhaps most important, this method implicitly discourages industry from developing the means to estimate itself what the market really wants. In the long run, do the Federal Government agencies really want to find themselves intermediaries between industry and the state and local buyers?

The third approach, which we advance, would have the Federal Government use its influence to encourage, persuade, induce, and motivate, industry to focus on the user's needs and—what is more important—on actually selling industries' output to the user. In particular, the Federal Government ought to encourage, as part of the fulfillment of suitable development contracts, that the developed advance be sold to some state and local Government entity. This might be called a "demonstration-sale" incentive contract. (In the case of failure to sell the project, the contract would require an explanation of the obstacles encountered, and so on). In the event of success, the demonstration would ensure that others, both in industry and in state and local governments, would have the project to point to as evidence that "it works." The contracting firm would have developed the sales and marketing infrastructure necessary to make the sale. Presumably it could and would try to sell the project elsewhere without further Government assistance. In the event of failure, the reasons for that failure might show the Federal Government what further incentives would be necessary to make the project salable.

No Substitute for Demonstration

Consider, for example, the idea of delivering educational lectures via television to students in their classroom. In the first place, the technology exists—one does not have to re-invent television or casettes. But it is not enough for the Government to give think-tanks a contract to produce a paper-and-pencil study of how these lectures might be delivered. After all, the real problems will come in dealing with the teacher's union, with school board budgets, with the preferences of students, and so on. Furthermore, there is no way for the Federal Government to aggregate the market. There is thus no substitute for encouraging industry to try to solve the complicated problem of selling a city of significant size on some particular method of doing it. The proof of the pudding is in the eating.

Last year, in a monograph, "The Struggle to Bring Technology to Cities," the Urban Institute summarized a symposium it held in 1970. Scattered throughout the volume is ample evidence of the need to urge industry to focus both on selling the user and demonstrating the device. Thus, the report emphasized:

> "Unless industry can be shown a large market potential, it will not be likely to invest in research for the cities. But it will seize upon a demonstrated success if the prototype is developed by someone else."

In short, Government ought to spur the development of an urban-industrial complex. It must encourage industry to develop the capability to deal with the real problems. It is to this end that we propose the demonstration-sale contract. □

NEEDED: CIVILIAN R&D

Turning to the adequacy of the Nation's investment in R&D, . . . practically all of the studies addressed to this question seem to conclude, with varying degrees of confidence, that we may-be underinvesting in particular types of R&D in the civilian sector of the economy, and the estimated marginal rates of return from certain types of civilian R&D seem very high."

—Edwin Mansfield, "Contribution of R&D to Economic Growth in the United States" Science Magazine, February 4, 1972.

FAS TESTIFIES BEFORE HOUSE ARMED SERVICES COMMITTEE

In an extraordinary hearing on March 27, the House Armed Services Committee could not decide how to respond to FAS testimony on manpower and, for the most part, simply tried instead to smear the witness.

The Federation was represented before the Committee by Herbert Scoville, Jr., Chairman of the FAS Strategic Weapons Committee, and by retired Army Colonel Edward L. King. In hearings before this Committee, the outside organization is given five minutes to state its position on the $25 billion ($25,000,000,000) military procurement bill. Each of the 41 Committee members who may be in attendance is then free to ask questions for five minutes. (The members have the organization's printed statement to skim at the same time.)

This Committee is, from the Federation's point of view, perhaps the most backward on Capitol Hill. Some of its

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BARRIERS TO IMPLEMENTATION OF NEW TECHNOLOGY: TWO APPROACHES

The National Science Foundation has launched a program on R&D incentives designed to increase the speed with which R&D is converted into socially useful purposes. It would seek to "overcome barriers to innovation, to uncover dormant technology, and to enable fragmented industries to take advantage of technological opportunities."

The general idea is to find ways of moving R&D from the laboratory to the marketplace by experimenting with institutional linkages and various incentives that might speed the process. The existence of the program reflects, it would seem, a widespread recognition that the R&D does indeed exist to do many things which, for one reason or another, the Nation is not doing. NSF proposes to look at this problem by working primarily from the University side. A comparable program designed to look at the problem from the industry side is being proposed by the Commerce Department's National Bureau of Standards. (It is ironic that the Government effort to resolve fragmentation between industry and university should itself be fragmented along the same lines.)

In testimony explaining the NSF program, Deputy Director Raymond L. Bisplinghoff said, of the innovation process: *"Of fundamental importance is the recognition of the overall unity that prevails throughout the total process."* Each NSF project will involve a problem area with the potential for both social and private benefits. Each will identify one or more blockages in the innovation process and a method for overcoming them. Each experiment will be evaluated to determine the degree to which the incentive mechanisms succeed.

The experiments are to be divided into three classes. In "Cooperative Research Initiatives," efforts will be made to establish a basis for better circulation of information, and for resolution of problems arising from the structure of industry and the nature of marketing. Special efforts will be made with regard to services (as opposed to production), such as experiments to increase the productivity of the service sector of business. The third area of experimentation will involve "human resources." Here such problems as motivation, training, and interchange of persons, job satisfaction, and so on will be considered.

The R&D incentives program proposed is experimental in part because there is uncertainty about which incentives are needed and about which will work. But Dr. Blisping-hoff also noted:

> "Although it has become increasingly clear that the Federal Government has an appropriate role in the stimulation of innovation in the civilian sector, it is less clear how this role should be implemented."

In short, the Government is not really sure what is to be done. There remains a lurking feeling that methods which are not already evident to a consensus are unlikely to seem evident later on the basis of NSF experiments. But NSF seems to be on the right track. Indeed, the FAS proposal on page one is—from the point of view of this program—simply a special case of efforts to break down "barriers.". □

SEN. KENNEDY PROPOSES MODEL CITY

In contrast to the detailed assessment of "blockages," Senator Kennedy has proposed a major demonstration of what new technology could, in principle, do for cities. On March 13, he urged that the Nation's architects and engineers "design and demonstrate a totally new city—a citizens' city—which shows us what is possible for all Americans in all cities." He proposed the expenditure of $2 billion over three years under a "National Science Policy and Priorities Act." The bill provides for $50 million for priority research areas; $1.2 billion to design technological systems for improved public services; $550 million to aid state and local governments, companies and individual engineers reconvert; and $200 million for long-term loans for unemployed scientists and engineers. The exact relationship between the model city—a combination of a World Fair and Williamsburg—and the $2 billion expenditure is not yet entirely clear. □

OFFICE OF TECHNOLOGY ASSESSMENT PASSES HOUSE OF REPRESENTATIVES

On February 8, the Office of Technology Assessment was approved by the House of Representatives, but changes in its structure may lead to its demise. The Office of Technology Assessment was originally proposed by former Congressman Emilio Q. Daddario in 1967 as an appendage to the Legislative Branch that would supply information on the expected impact of new technologies: SST's, nuclear power plants, etc.

The original formulation envisioned a board of eleven members composed of a Director, two members of the Senate, two members of the House of Representatives, the Comptroller General, the Director of the Congressional Research Service, and four eminent public members appointed by the President and confirmed by the Senate. With its Director on the Board, and four public members, the OTA would be capable of becoming somewhat more than, for example, the faceless staff of a Joint Congressional Committee.

When the bill passed the House of Representatives, it was amended to provide for a Board composed of five members of the Senate and five members of the House (appointed by the President *pro tempore* of the Senate or the Speaker of the House, respectively). Under such a Board, the OTA Director could be expected to be pulled asunder by the political pressures of a political Board. The action of the House in questioning the original structure of the Board has set in motion second thoughts in the Senate, and the passage of the Office is not assured.

As currently planned, the Office is to have a small group of experts in the physical, biological, and social sciences but would contract out studies. $5 to $10 million dollars a year would be its budget. There is inevitably considerable uncertainty surrounding the scope of the OTA's charter and its method of operation. But the Federation endorsed the bill and, in a letter from Chairman Marvin L. Goldberger to Senator Kennedy, FAS warned against restricting the powers of the OTA Director. It argued: "If Congress expects objective information from the OTA, it must not, at the same time, require the OTA to be entirely the servant of political forces." □

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members speak as if the Committe saw its job as nothing more than to be the spokesman, in Congress, of the military man's point of view.

Colonel King was arguing the easy-to-believe thesis that the Army had too much fat in its division (a long logistic tail) and not enough fighting men as a result. He was overflowing with documentable details. And he personified the military man's point of view that the Committee claims to champion. The result was consternation.

Inane Questioning

One Committee member used his five minutes to lecture the witnesses by reciting the tale of Carthage. Another asked only if Colonel King was receiving Army retired pay; upon hearing an affirmative answer, the Congressman concluded curtly ("That's all I have,"). His manner suggested that an army officer on retired pay was obviously disloyal to tell a Congressional committee that all was not perfect in the Army! The Committee Counsel spent his time trying to discredit the witness' credentials. When Colonel King mentioned mildly, toward the end, that his views had originated with his 19 years in the Army, the hearing was promptly concluded with the Counsel's parting shot—"We've heard enough about your military experience."

However, a few Congressmen were fascinated by what may have been the first candid statement of matters that interest them presented to the Commitee in a long time. One asked serious questions about recruiting—a special responsibility of his. Another said he would follow up some of the points raised. One of the few dissidents on the Committee, Congressman Harrington, used his time to note that the Committee as a whole—though fair in its treatment of dissident points of view—was "simply wash-through" the budget and not really giving it a serious review. This was all too obvious. This Committee tries the faith of even those most loyal to the prerogatives of Congress.

After hearing the Federation, and a handful of other outside witnesses, the Committee set aside a day to hear from aerospace companies, who advised them that the Soviet Union was going to achieve technological superiority. □

PH.D. SURPLUS LOOMS

The American Ph.D. surplus does not seem to be a temporary accident of present circumstances. It was coming before the recent cutbacks in Federal science expenditures, and it will outlive them.

As Derek J. deSolla Price has shown, the trend line in this century for all Ph.D.'s (around which increases and decreases oscillate) shows a 6.8% annual increase. The 11% rate of increase during the 1960's must eventually, by this analysis, produce a corresponding decline. Further, as he shows elsewhere, science has been doubling in size every 7 to 10 years (depending upon what is being measured). This condition itself cannot be continued indefinitely and now shows signs of passing through three decades of linear rather than exponential growth. Still other path-breaking work of Dr. Price suggests that scientific publications (appropriately measured) appear in close proportion to GNP in almost all countries. (The only two major exceptions are Israel, on the high side, and China, on the low.) If so, the rate of growth of science should stablize around the rate of growth of GNP.

Academic Jobs Declining

A closer look at the particular factors involved in the surplus of this period is no more encouraging. At the present rate of utilization of Ph.D.'s in different kinds of educational institutions, these institutions will absorb 30% of new Ph.D.'s from 1970-74; 20% from 1975-1979; 10% from 1980-84; and perhaps none in the late Eighties, when university enrollment may decline absolutely. Only about 2% of academics die or retire each year, and the enrollment rate of students (for the Ph.D.'s to teach) is projected to drop steadily until the late Eighties. As academic teaching jobs decline to zero by 1990, numbers of Ph.D.'s may rise to somewhere between 60 and 100 thousand per year, depending upon whose estimates one favors.

Changes in the view of the National Science Foundation have begun to support this. In considering Ph.D.'s and engineers, NSF projects a surplus of 40% (!) by 1980 in engineering, 20% in social science doctorates, 10% each in mathematics and life sciences, and rough balance in physics. Overall, 40,000 engineers and Ph.D.'s might not find suitable employment by 1980. □

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