THE ROLE OF NEW TECHNICAL ENTERPRISES IN THE U.S. ECONOMY

A

Report of the

Commerce Technical Advisory Board

to the

Secretary of Commerce

Commerce Technical Advisory Board Membership 1975

CHAIRMAN
Dr. Betsy Ancker-Johnson
Assistant Secretary for
Science and Technology
U.S. Department of Commerce

Vice Chairman
Dr. Donald W. Collier
Vice President—Technology
Borg-Warner Corporation

Mr. William D. Carey
Executive Officer
American Association for
the Advancement of Science

Dr. Paul F. Chenea
Vice President—Research Labs
General Motors Corporation

Dr. John F. Collins
Consulting Professor of
Urban Affairs
Sloan School, Massachusetts
Institute for Technology

Mr. Richard H. Demmy
Vice President
UGI Corporation

Dr. Thomas G. Fox
Professor of Chemistry

Dr. Arthur R. Kantrowitz
Vice President, Director
AVCO Corporation

Mr. Willie L. Leftwich
Attorney-at-Law
Hudson, Leftwich and Davenport

Mr. Albert A. Monnett, Jr.
Vice President—Corporate
Planning
U.S. Steel Corporation

Dr. Richard S. Morse
President
MIT Development Foundation, Inc.

Dr. William J. Pietenpol
Consultant

Dr. Malcolm E. Pruitt
Vice President and Director of
Research and Development
The Dow Chemical Company

Dr. Martha C. Sager
Director, Environmental Systems
Management Program
American University

Mr. Sheldon W. Samuels
Director, Health, Safety and

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

The Honorable Rogers C.B. Morton
Secretary of Commerce
Washington, D. C. 20230

Dear Mr. Secretary:

The climate today as seen by entrepreneurs is very poor for the start-up of highly innovative, risky, advanced technology companies, and our impression is that fewer and fewer of them are emerging. Some illustrative data are used in this "White Paper," which has been elicited and endorsed by the Commerce Technical Advisory Board to address the current problems of generating new enterprises. Some suggestions are made about what might be done to encourage the advent of such new, small companies which represent the future large corporations of our society.

This paper was authored by Richard S. Morse in collaboration with John O. Flender, Treasurer of the M.I.T. Development Foundation, and after consultation with a number of knowledgeable people selected from the fields of technology, law, government, finance and accounting. Mr. Morse, a longtime member of CTAB, has had many years of experience in fostering the start-up of high technology companies. CTAB hopes that you will share our concern and seek the creation of a climate conducive to new, innovative business enterprises with their attendant job opportunities.

Sincerely,

Betsy Ancker-Johnson
Assistant Secretary of Commerce

RICHARD S. MORSE

President, M.I.T. Development Foundation, Inc.
Senior Lecturer, Sloan School of Management, M.I.T.

Received S.B. in Engineering from the Massachusetts Institute of Technology, Class of 1933; graduate work in Physics at the Technische Hochschule, Munich, Germany, 1933-1935. Awarded Honorary Degrees of D. Eng. and D. Sc. and the Distinguished Civilian Service Medal.

After five years as a member of the scientific staff at Eastman Kodak, he founded and for 20 years served as President of National Research Corporation, one of the first so-called "Route 128" companies. As one of the early pioneers in high vacuum technology, he holds some 25 patents and was associated with such industrial innovations as vacuum coating of optics, high vacuum melting of metals and alloys, freeze-drying of penicillin and plasma, and the organization of Minute Maid, the first producer of citrus concentrate. During his entire professional career he has been associated with the organization, management, and financing of new technical enterprises, and the role of technology in government and the university.

He served as Director of Research and Assistant Secretary of the Army (R&D) 1959-1961 and has had many other government responsibilities. These have included: Chairman, Army Science Board; Chairman, Air Force Systems Command Advisory Board; member, Defense Science Board. As one of the initial members of the Technical Advisory Board of the Department of Commerce, he served on the Panel on Innovation and Invention and as Chairman of the 1967 study, "The Automobile and Air Pollution." He was recently appointed by President Ford as a member of the General Advisory Committee on the Energy Research and Development Administration (ERDA).

As Senior Lecturer at the Sloan School of Management at M.I.T., he initiated a graduate

The Role Of New Technical Enterprises In The U.S. Economy

I. The Contribution of New Technical Enterprise

Many factors—domestic and world-wide—influence the U.S. economy and employment. These factors include the increasing cost of imported energy, the declining supply of domestic natural resources, and the competition from imported goods manufactured with low cost labor or with increasing productivity. For all these reasons and for others, the U.S. must rely more heavily on the manufacture of high technology products—both for domestic consumption and for export—in order to maintain a high level of employment and a favorable balance of payments. Technology plays a crucial role in the maintenance of a sound domestic economy; its application is essential for the enhancement of productivity, creation of new jobs, and our ability to compete in the world marketplace. Against this background, it is important to review the current environment for technological innovation in the United States.

Many foreign countries recognize the importance of maintaining a healthy climate for technical innovation and have taken positive steps, particularly in the support of new product development, to encourage the innovative process. Our country unfortunately has no effective spokesman for either the entrepreneur or new enterprise generation. Congress has historically shown an increasing lack of understanding of the innovative process, the need for incentives for the entrepreneur and the venture capitalist, and the role of new technical enterprises in the U.S. economy.

While mechanisms for more effective applications of science, technology, and innovative management represent a general requirement

important fact came to light, namely that the rate of sales growth and job creation occurs more rapidly in the innovative high technology companies than it does in the more mature organizations. The data for those relatively new innovative companies shown in the 1967 report have been revised to cover the period 1945-1974 and appear below. For comparative purposes, data for the same period for selected mature companies from a variety of industries are also shown. (See Table I.)

TABLE I

Average Annual Growth (Compounded) [a]
1945-1974

Innovative Companies	**Sales**	**Jobs**
Polaroid	14.0%	9.0%
3M	14.1%	9.0%
IBM	16.8%	10.2%
Xerox	24.2%	19.4%
Texas Instruments (1953-1974)	21.2%	17.3%
Weighted Average	16.5%	10.8%
Mature Companies	**Sales**	**Jobs**
Bethlehem Steel	4.9%	—1.7%
DuPont	8.6%	2.6%
General Electric	8.4%	3.5%
General Foods	8.2%	4.5%
International Paper	9.2%	2.8%
Proctor & Gamble	9.6%	3.8%
Weighted Average	7.8%	1.9%

TABLE II

Average Annual Growth (Compounded) [2]
1969-1974

Young High Technology Companies

Date Incorp.		Sales	Jobs
1968	Data General	140.5%	82.5%
1959	National Semiconductor	54.3%	59.4%
1960	Compugraphic	50.2%	24.0%
1957	Digital Equipment	36.8%	30.7%
1964	Marion Labs	24.5%	25.4%
	Weighted Average	42.5%	40.7%

[2] *Moody's Industrial Manual,* Moody's Investors Service, Inc., New York, New York. See Appendix A for more detailed data.

During the five-year period 1969-1974, the average annual percentage growth rates of the companies in each of these three groups was:

	Sales	Jobs
Innovative Companies	13.2%	4.3%
Mature Companies	11.4%	0.6%
Young High Technology Companies	42.5%	40.7%

It is worth noting here that, during this five-year period, the six mature companies with combined sales of $36 billion in 1974 experienced a net gain of only 25,000 jobs, whereas the five young, high technology companies with combined sales of $857 million had a net increase in employment of almost 35,000 jobs. The five in-

technically-based new enterprise, innovation is a way of life and is responsible for the creation of new products, processes and job opportunities.

No claim is made that the data presented above result from a rigorous statistical study of U.S. businesses. The claim is made that these data indicate trends in the business community, point to the role of new innovative companies in the development and commercialization of new technology, and suggest the importance of continuing utilization of new technology to the creation of jobs.

The business environment which led to the growth of companies like IBM, 3M, Polaroid, Texas Instruments, and Xerox in the post World War II years, and which encouraged the establishment of Digital Equipment, National Semiconductor, and other high technology companies in the 1950's and 1960's was a favorable one. Entrepreneurs were plentiful and enthusiastic. They were encouraged by economic incentives and by the freedom of the system which allowed them to function and to be creative without the constraints inherent in large corporations. U.S. Government research and development funds were available to small companies, and more than a few entrepreneurs built successful businesses on DOD and NASA contracts that nurtured the "know-how" ultimately utilized not only for the sponsor's mission but also in high-technology commercial products. Capital was obtainable, either from established venture capital sources, individual investors or through the sale of securities to the public.

II. Adverse Changes in the Business Environment

In the late 1960's and early 1970's changes took place in the environment for the establishment of new high technology enterprises. They resulted in a reduction in the rate at which

constant dollars (and as a percentage of GNP) began to decline. Other measures, particularly the adoption of the Mansfield Amendment, tended to restrict DOD funding of R&D to specific agency mission-oriented tasks and to eliminate support for new innovative technical ideas.

Both small companies and universities were directly affected by these changes. Not only were government R&D contracts no longer a mechanism for small companies to get started, but also government-sponsored university research became so oriented that opportunities were greatly reduced for the fruits of such work to continue to lead to the establishment of new companies that commercialized new technologies. (The RANN—Research Applied to National Needs—Program of the National Science Foundation may be an exception to this generalization.)

Another change related to government funding of R&D has been the reduction in acceptance of unsolicited and of sole source proposals in favor of competitive bidding for R&D procurement. Although not generally understood, the unsolicited proposal has played a unique role in the development of innovative technologies by providing relatively small amounts of money to bring a new concept or technology to the point where a product might emerge. Today, an unsolicited proposal may provide the basis for a request for additional proposals and competitive bidding. The practice of competitive bidding tends to favor the large corporation which has the ability to submit and resubmit detailed and costly proposals to fit the requirements of a particular situation.

Contract administration of government sponsored R&D also has become overwhelmingly burdensome and often, particularly in small companies, the monitoring and reporting requirements have grown

curbed, but the unique incentives previously offered by stock options to the entrepreneur were essentially eliminated.

Income taxes have now been adjusted so that salaries and wages become taxable by the Federal Government at a maximum rate of 50% while capital gains taxes have increased from the maximum of 25% to 35%. Simultaneously, more and more states have levied new income taxes or increased existing ones. In some states considerably higher rates are applied to unearned income and to capital gains than are applied to salaries and wages. The result has been a significant narrowing of the gap between income tax and capital gains tax rates and a corresponding reduction in financial incentives for the entrepreneur. As a result of the changes in the tax structure and in the stock option rules, the entrepreneur now finds that the potential "after tax" gain from starting his own company may not be commensurate with the risks, and that employment by a large company at a relatively high salary tends to have greater overall attraction.

C. *Regulatory Environment.* During the last five years, the impact of the government regulatory agencies has been increasing. Environmental requirements, the need for impact statements for new activities, safety and health regulations, etc., at all levels of government have changed the business climate for both large and small companies. Sometimes the small company can operate more freely than the large company within this new climate, but when conformity is required, the small entrepreneur is less well equipped both financially and with respect to manpower than the large organization.

The direct cost of conforming with specific new regulatory requirements is easily identified, but what about the indirect costs to the

ments are now so onerous and expensive that many small publicly held companies are looking for ways to reduce their number of stockholders in order to avoid the reporting requirement.

D. *Reduction of Liquidity.* In recent years, many professional investors have been discouraged from providing seed capital to new companies because liquidating their investment in a reasonable time period may be too difficult. Three factors have contributed to the reduction in liquidity; first, the cost of "going public" has for many companies become prohibitive; second, the public, as a result of bad experiences, is unwilling to invest in speculative securities; and third, SEC regulations significantly restrict the large stockholder from disposing of his securities in a reasonably short period of time. The SEC's new Rule 144 has benefited investors by clarifying a number of unanswered questions regarding the resale of unregistered securities when a public market exists. However, Rule 144 does not apply in the absence of an established market. To solve this problem the SEC has been promising for many years a Secondary Private Placement Rule, but the rule has not been forthcoming. At the present time, there is no way a large investor can liquidate a significant portion of his holdings in a private transaction without running the risk of being in violation of the Securities Act.

E. *Reporting Procedures and Public Disclosures.* In recent years the SEC has pushed for more prompt and detailed disclosure of matters pertaining to the business of a so-called "reporting company." The result has been a staggering increase in legal and auditing costs as well as in the nonproductive work load. Small companies have been particularly hard hit by these requirements which take a disproportionately large percentage of their overhead effort and

technical companies included within the group of small companies described above, declined from an average of 33% in 1969 and 1970 to an average of only 23% in the years 1971 through 1974. It should also be noted that between March of 1974 and August 1, 1975 there have been *no* public financings of small technical companies. (See figure on adjoining page.)

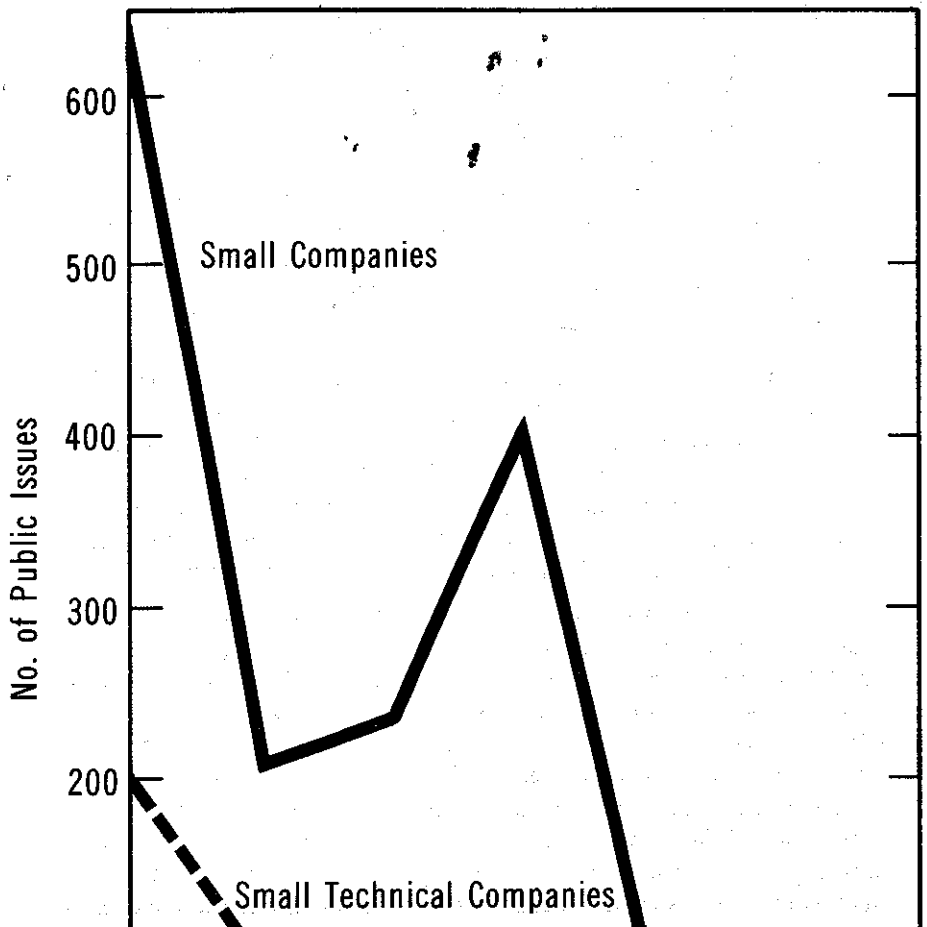
In late 1974, a survey was made of the members of the National Venture Capital Association (NVCA) regarding the number and amount of private financings concluded during the previous five years. Fifty-seven firms, or 71% of the membership, responded to this survey as tabulated below:[4]

	No. of Venture Capital Firms Involved in New Financings	Number of New Financings	$ Value of Financings (Millions)
1970	39	223	$66.4
1971	48	225	84.5
1972	47	223	89.8
1973	46	185	93.5
1974 (nine months)	37	93	47.8

The statistics indicate a distinct decline in venture capital investments in new projects during the period 1973 through 1974. Although the 1974 data are for a nine month period and may not be indicative of the level of activity during the entire year, NVCA officials indicate that there were very few financings during the last quarter of 1974. Their views are substantiated by the public issues data, taken from *Venture Capital* (See Appendix B.)

Unfortunately, data regarding the financing of technical "start-up" situations and very new companies are almost nonexistent. The

Number of Small Company Public Issues by Years



from within the venture capital community, however, suggests that recent financings during the past five years involved relatively conservative investments in seasoned companies, as contrasted with more speculative, early stage investments. There is sufficient information, in the NVCA study to support this contention.

If, as indicated by the NVCA data, the number of private venture capital financings is declining, quite naturally the question arises, "Is unused capital available?" The survey indicated that about 22% of the capital invested by those who responded was in cash, but went on to say: "Since most venture firms tend to hold cash reserves for contingencies, it would appear the venture industry is currently rather fully invested."

Both the public issues data and the private financings data reflect the declining number of financings by clearly identifiable segments of the financial community. There are no data regarding the individual and truly private sources of seed money. One possible, but as yet unverified, source of venture capital may come from corporations which are interested in diversification and access to new technologies through the acquisition of minority interests in small companies.

The most serious shortage of capital has been experienced by those individuals and organizations looking for seed money or "start-up" capital. Investors, who in the past readily provided limited funds to a brand new enterprise which appealed to them, now shun a "start-up" situation. Why? First, "start-ups" require far more money than was needed five to eight years ago. Inflation is partly responsible for higher costs, as is increased regulation of business. The absence of government R&D that formerly expedited the initiation of technologically-based companies has raised significantly the cost of starting such companies. Second, because of the current economic environ-

"leverage" money is extremely difficult to obtain, and even if such a loan is arranged, personal guarantees of officers and directors are usually required.

Given these problems in acquiring venture capital today, it is remarkable that any new companies have been started and financed in the last three years.

III. Recommendations for Corrective Action

As observed in the 1967 CTAB report on technological innovation, the entrepreneurial process, particularly as it relates to high technology companies, is not well understood. It has been noted, however, that the process can occur only in a favorable environment. This environment has deteriorated over the last few years in the following manner:

1. Government R&D programs are a less significant factor in stimulating high technology companies. The character and complexity of government procurement policy and procedures and its management methods have resulted in a significant deterioration of the effectiveness of these programs in stimulating these companies.
2. Financial incentives for the entrepreneur and the investor have declined.
3. Government regulation has greatly increased the operating cost and management problems of new business enterprises.
4. The liquidity of investments in small companies has been reduced by the absence of a receptive public market and by regulation.

in the decades ahead. If the future economic health of the country is to be insured, it is apparent that steps must be taken to improve the business environment. It is probably impossible to predict quantitatively the extent to which any specific legislative or administrative change might stimulate or expedite the generation of new business enterprises. Nevertheless, the following *recommendations* are suggested for executive and legislative action with the expectation that these actions would enhance the initiation and growth of new technically-based enterprises:

1. *Change Capital Gains Tax.* A reduced capital gains tax rate for direct investment in small technical enterprises should be an effective incentive to make venture capital available for "start-ups." Such an incentive should be available to both corporate and individual investors.

2. *"Founders' " Stock.* A new mechanism is needed to facilitate the acquisition of "Founders' " stock by officers, directors, and key employees during the formative years of a company. Care should be taken to prevent adverse tax consequences which negate the value of the stock in attracting key talent to the enterprise team.

3. *Recognize the Role of Corporate Investors.* The institutionalization of the venture capital community and the increasing use of the industrial corporate venture mechanism suggest that it would be desirable to allow corporate participation under both Sub-Chapter S and Section 1244 of the Internal Revenue Code.

4. *Tax Incentive for Direct Investment in Small Technical Enterprises.* An immediate deduction against income for individual,

6. *Review Reporting Procedures.* Reporting requirements under the rapidly growing state and federal regulations should be reviewed with the intent of simplifying the requirements for small companies.

7. *Review Tax and SEC Regulations.* General cost increases and inflation have made dollar limits in certain rules too small. In particular, for 1244 stock, the maximum asset value should be increased to $1,000,000; the loss allowance should be increased to $50,000 on an individual basis, and $100,000 on a joint return basis. Similarly, the capitalization limit for a Regulation A registration should be increased to $1,000,000. The small business 22% tax rate should be applied to the first $100,000 of income rather than $25,000. The tax-loss carry-forward period should be extended from five years to ten years.

8. *Review Incentives for Management.* For the new enterprise, the value of stock options as a management incentive can be restored by reducing the holding period for shares issued under a qualified plan and by arranging to defer tax liability for shares issued under a non-qualified plan. Other forms of financial and tax incentives should be developed for the management and key employees of the higher-risk new technical enterprise.

APPENDIX A

Sales & Employment Data 1945-1974 & 1969-1974

les 69 illions)	Sales 1945	Annual Rate 1969-1974 %	Annual Rate 1945-1974 %	Employment 1974	Employment 1969	Employment 1945	Annual Rate 1969-1974 %	Annual Rate 1945-1974 %
		Sales Data				**Employment Data**		
	—	140.5	—	3,452	170	—	82.5	—
	—	54.3	—	17,610	1,710	—	59.4	—
	—	50.2	—	1,864	637	—	24.0	—
	—	36.8	—	17,600	4,615	—	30.7	—
	—	24.5	—	1,440	465	—	25.4	—
	—	—	—	41,966	7,597	—	40.7	—
	16.8	7.7	14.0	13,019	10,506	1,058	4.4	9.0
	63.6	12.7	14.1	83,609	66,260	6,795	4.8	9.0
	141.7	12.0	16.8	292,350	258,662	17,500	2.5	10.2
	6.7	19.2	24.2	101,380	54,882	593	13.1	19.4
	27.5	13.6	21.2	65,524	58,974	2,300	2.1	17.3
	N.A.	13.2	16.9	555,882	449,284	N.A.	4.3	11.1
	1,327.	12.9	4.9	122,000	130,000	202,095	(1.3)	(1.7)
	631.6	13.8	8.6	136,836	118,079	63,939	3.0	2.6
	1,298.	9.7	8.4	404,000	400,000	148,233	0.2	3.5
	307.1	9.5	8.2	47,000	42,000	13,000	2.3	4.5
	240.0	11.7	9.2	52,715	54,500	23,414	(0.7)	2.8
	342.5	12.6	9.6	49,800	43,214	14,800	2.9	4.3
	4,146.	11.4	7.8	812,351	786,793	465,481	0.6	1.9

Services, Inc., New York, New York

Appendix B

New Small Company Public Issues

($ in millions)

	Small Companies		Small Technical Companies	
	Dollars	Number	Dollars	Number
1969	$1,103	649	$349	204
1970	386	210	149	86
1971	528	244	138	73
1972	921	418	194	104
1973	158	67	38	19
1974	16	9	6	4
1975 (6 mos.)	4	1	0	0

Includes all "firm" underwriters of equity securities of less than $5 million for companies with net worth, prior to offering, of less than $5 million. Excludes Regulation A offerings, "best efforts" sales, government securities and foreign issues. Data from *Venture Capital* published by S. M. Rubel and Company, Chicago, Illinois.