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ABSTRACT

The purpose of this paper is to assist vocational educators at all levels as they make long-range plans and policies that have an impact on vocational education programs and their relationship to worker productivity. In the first section a study of worker productivity analyzes trends and then measures and analyzes the determinants of productivity. The three main inputs--physical capital, natural resources, and labor--are briefly discussed. Other factors that influence the mix of inputs are also considered. The second section identifies a number of strategies for improving the quantity and quality of worker productivity. These include self-motivation and management tools for making labor more productive such as motivation techniques, management by objectives, job enlargement and enrichment, flexible working hours, and quality control circles. The role of vocational education in increasing worker productivity is discussed in terms of (1) planning programs based on emerging patterns related to the way in which workers change jobs and occupations, (2) enriching the quality of human capital, and (3) providing entry-level skills for new or emerging occupations through expanded and relevant program content. (YLB)

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WORKER PRODUCTIVITY
A Challenge for Voc Ed

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FOREWORD

Worker Productivity: A Challenge for Voc Ed addresses major problems that confront vocational educators and business leaders alike and reviews strategies for improving the quantity and quality of worker productivity. These discussions should provide some indicators as to the direction vocational education program efforts should take in the near future.

This paper is one of seven interpretive papers produced during the fourth year of the National Center's knowledge transformation program. The review and synthesis in each topic area is intended to communicate knowledge and suggest applications. Papers in the series should be of interest to all vocational educators including teachers, administrators, federal agency personnel, researchers, and the National Center staff.

The profession is indebted to Dr. Gary E. Clayton for his scholarship in preparing this paper. Dr. Glenn H. Varney of Bowling Green State University and Dr. William Ashley of the National Center for Research in Vocational Education contributed to the development of the paper through their critical review of the manuscript. National Center staff on the project included Alta Moser, Shelley Grieve, Raymond E. Harlan, Dr. Judith Samuelson, and Dr. Jay Smink. Editorial assistance was provided by Sharon Fain of the Field Services staff.

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EXECUTIVE SUMMARY

The purpose of this paper is to assist vocational educators at all levels as they make long-range plans and policies that have an impact on vocational education programs and their relationship to worker productivity. Because resources are increasingly scarce and because demands on worker productivity are increasingly insistent, the topic of worker productivity is critical to our nation's future and its economic well-being.

The study of worker productivity involves the examination of its determinants; specifically, the analysis of the contributions of physical, natural, and labor resources to production. The paper, in reviewing productivity trends, also addresses major problems that need resolution before productivity-related vocational education can be expanded. These include the identification and measurement of factors that influence the mix of physical capital, natural resources, and labor force; the degree of influence of economic and social regulations by government; the impact of adequate worker preparation; and the role of white-collar, supervisory, and management personnel in productivity processes.

The author identifies and discusses a number of strategies for improving the quantity and quality of worker productivity: self-motivation and management tools for making labor more productive such as motivation techniques, management by objectives, job enlargement and enrichment, flexible working hours, and quality control circles. The author concludes that vocational education has a role to play in increasing overall worker productivity. Specifically, vocational educators can contribute significantly to increased worker productivity by planning programs based on emerging patterns that relate to the way in which workers change jobs and occupations, by enriching the quality of human capital, and by providing the entry-level skills demanded by new or emerging occupations through expanded and relevant program content. The challenges to vocational educators are to infuse communication and task-related skills into occupational curricula and to keep those curricula up-to-date.

INTRODUCTION

The purpose of this paper is to examine the topic of worker productivity. Broadly defined, productivity deals with the way in which inputs of resources—natural, human, and physical capital—are combined to produce outputs of goods or services. The extent to which we succeed (or fail) has a direct bearing on the health of our nation's economy and, therefore, on our quality of life. In an environment where resources are becoming increasingly scarce and the demands on output increasingly insistent, the issue of productivity has become critical to our future.

The labor or human capital factor in the productivity equation is defined as "output per worker hour" ("Productivity Data" 1981), and is the standard of measure that has replaced the more general "outputs to inputs" ratio. It can be argued that human capital is not the only production factor responsible for productivity growth or the lack thereof. But productivity is usually measured in such terms because labor input data are the most easily obtained. However, these data at best provide only a partial picture of productivity growth. Worker attitudes, motivation, and performance are important, but they can easily be offset by shortages of raw materials or capital goods such as those that could occur during an oil embargo or during a rail or truck strike.

The role of vocational education in the overall productivity picture is a positive one (Worthington 1981). The main mission of vocational education—to prepare people for work (Bottoms 1980)—relates directly to the productivity issues being examined here. Vocational education students should be made aware of the importance, magnitude, and determinants of productivity. Even though workers are not solely responsible for the overall productivity picture, students should be ready to examine their own roles as future productive inputs so that they can have a better understanding of the ways in which they can increase their contributions to the nation's economic well-being.

THE PRODUCTIVITY PICTURE

The study of productivity is necessarily complex. At a minimum, it involves analyzing trends and measuring and analyzing the determinants of productivity.

Productivity Trends

According to statistics compiled by the U. S. Department of Labor, the productivity growth rate of the United States has been on the decline since the mid-sixties (Congressional Budget Office 1981). As can be seen in table 1, total private business productivity reached a high of 3.5 percent in the 1947-1955 period and dropped to a low of -.8 percent as recently as 1979. The pattern for the intervening years has been consistently and decidedly downhill.

On an international basis, the United States economy has performed poorly as evidenced in table 2. Whether annual growth is measured from the mid-sixties to the mid-seventies, or from the mid-seventies to the end of the decade, the United States placed last behind traditionally slow-growth countries such as the United Kingdom. Whether or not the relative decline on an international scale is serious depends on one's point of view. The United States emerged from World War II as the technological leader of the free world. In contrast, countries that emerged from World War II with a less developed technology made use of the technology available in the United States. Having started at a lower level and having a ready source of assistance (the United States) available, it was easier for these other countries to achieve increases in productivity (Lawrence 1980). Regardless of why other nations outrank the United States, the majority opinion is one of concern over the decline in our productivity growth (Sullivan 1981).

Historically, productivity growth in manufacturing has been higher than in service industries (Malabre 1981). This has been due to the fact that the manufacturing sector is usually the prime beneficiary of the machines, tools, and industrial processes that help increase productivity. The services sector, on the other hand, has been less productive because it has required a lower capital/labor ratio and, therefore, has been influenced less by improvements in the capital stock (Levitt 1977).

This broad generalization has recently been questioned by several analysts. A report currently being compiled by the American Productivity Center, for example, concludes that productivity has actually gone up, rather than down, as a result of the shift of labor into the service industries (Malabre 1981). Other reports lend indirect support to this view. For example, the banking industry keeps records of the efficiency of its check processing operations on a yearly basis. In 1978 bank labor productivity increased by 13 percent over the previous year ("Banks Aim to Cut Costs" 1978). In the previous year, productivity increases for roughly comparable operations were in the range of 12 percent. When the Beneficial National Life Insurance of New York switched to microfilm technology to eliminate mountains of paperwork, a labor productivity gain of 600 percent was reported ("Managing Microfilm Records" 1980). And when a medium-sized grocery chain in California switched to optical scanners, labor productivity increases of 18 percent were reported (Rauch 1977).

TABLE 1

LABOR PRODUCTIVITY GROWTH RATES IN THE UNITED STATES, BY SECTOR, SELECTED PERIODS, 1947-1979
(Percent Changes at Annual Rates)

Periods	*Total Private Business*	*Farm*	*Total Nonfarm Business*	*Manufacturing*	*Nonfarm Nonmanufacturing*
1947-1955	3.5	6.4	2.7	3.6	2.2
1955-1965	3.0	5.1	2.6	2.8	2.4
1965-1973	2.2	5.2	1.9	2.4	1.7
1973-1978	1.0	2.8	0.9	1.5	0.6
1978-1979	-0.8	4.7	-1.0	0.8	-2.0

SOURCE: Congressional Budget Office 1981.

TABLE 2

ANNUAL GROWTH IN GROSS DOMESTIC PRODUCT PER EMPLOYED WORKER IN MAJOR INDUSTRIAL COUNTRIES, 1965-1979
(Percent Changes at Annual Rates)

Country	*1965-1973*	*1973-1979*[a]
United States	1.6	0.3
Canada	2.4	0.4
United Kingdom	3.4	1.1
Italy	5.8	1.7
France	4.5	2.9
West Germany	4.3	3.1
Japan	9.1	3.4

SOURCE: Congressional Budget Office 1981.

[a]Data for 1979 are preliminary.

Despite these and other selected examples of increased productivity in the service industries, the weight of the evidence seems to indicate that overall productivity growth in the services sector lags behind that of the industrial sectors. Table 3, for example, presents productivity growth rates and standardized levels of value added per worker hour for various industrial sectors. The first three columns report the average of annual productivity growth rates for three different time periods and for various sectors. The sectors of agriculture, forestry, and fisheries; communications; and electric, gas, and sanitary services had the highest overall growth rates for the entire three-year period. The industrial sectors of wholesale trade; retail trade; and finance, insurance, and real estate were generally below the overall average for all industries combined. The services sector was in last position in the 1949-1965 period, third from the bottom in the 1966-1973 period, and fourth from the bottom in the most recent period, 1974-1978. In each time period, the services sector was substantially below the average for all sectors combined.

The standarized value added per worker hour is listed in the fourth, fifth, and sixth columns of table 3. Figures in these columns indicate the level of productivity of each sector, as opposed to the rate of growth of the level reported in the first, second, and third columns. When the comparison is made by levels of productivity, the industrial sectors of mining; electric, gas, and sanitary services; and finance, insurance, and real estate have the highest overall ratings, while the services sector performed below average in all time periods. Between 1948 and 1978, four sectors—mining; construction; finance, insurance, and real estate; and services—recorded substantial declines in productivity. The decline in the services sector, from .80 to .63 for a change of -21.25 percent, is particularly disturbing in that the standard level of output per worker was below average for the first time period, 1948-1965, and has continued to decline.

Some writers have suggested that productivity declines in the services sector are due to the shift of workers out of agriculture and into the services sector (Levitan, Mangum, and Marshall 1981). According to the information presented in table 4, this shift of human resources has indeed taken place; although it is not clear what relationship this shift has had to productivity. The data presented in table 4 show that the sectors of agriculture, forestry, and fisheries; nondurable goods manufacturing; and mining have experienced the greatest declines in annual rates of growth for hours worked. On the other hand, the greatest increase in the percentage distribution of hours worked has been in the finance, insurance, and real estate sector, where a 45.2 percent increase took place (from 4.2 to 6.1). The second largest percentage increase was registered by the services sector with a gain of 35.6 percent, followed by the wholesale trade sector with 26.4 percent.

Tables 3 and 4 provide evidence that the addition of new workers is not always detrimental to worker productivity. Although the finance, insurance, and real estate sector picked up the largest relative share of workers (table 4), it is still the sector with the highest level of worker productivity (table 3). Even the growth rate of this sector was above average for the 1974-1978 period according to table 3. On the whole, the aggregate statistics tend to support the commonly held view that productivity has fared less well in the services sector than in industrial areas. There are reports of large productivity gains in the services sector, but at the present time it appears that they are the exception rather than the rule.

Productivity Determinants

In order for services to be performed or goods to be produced, productive processes are set up to utilize combinations of three main inputs—physical capital, natural resources, and labor. Each of these inputs, and other factors that influence the mix of inputs, are discussed briefly.

TABLE 3

RATES OF PRODUCTIVITY GROWTH AND STANDARDIZED LEVELS OF VALUE ADDED PER WORKER HOUR, BY INDUSTRIAL SECTOR

Industrial Sector	Average of Annual Productivity Growth Rates (percent)			Standardized Value Added Per Worker Hour[a] (average=1.00)		
	1949-1965	1966-1973	1974-1978	1948-1965	1966-1973	1974-1978
Agriculture, Forestry, and Fisheries	5.0[b]	3.7[b]	2.1[b]	0.46	0.58	0.60
Mining	4.3	1.9	-4.8	1.78[b]	1.98[b]	1.51
Construction	3.4	-2.1	-1.0	1.16	0.99	0.77
Nondurable Goods Manufacturing	3.3	3.3	2.4[b]	0.91	0.94	1.02
Durable Goods Manufacturing	2.8	2.2	1.2	1.06	1.02	1.03
Transportation	3.1	2.9	0.8	1.06	1.09	1.11
Communications	5.4[b]	4.6[b]	7.2[b]	1.32	1.73	2.29[b]
Electric, Gas, and Sanitary Services	6.4[b]	3.5[b]	0.8	2.07[b]	2.65[b]	2.69[b]
Wholesale Trade	3.1	3.4	-0.5	1.25	1.30	1.24
Retail Trade	2.7	2.1	1.1	0.66	0.63	0.63
Finance, Insurance, and Real Estate	2.0	0.2	1.8	3.68[b]	3.02[b]	2.90[b]
Services	1.2	1.7	0.3	0.80	0.65	0.63
Total	3.3	2.2	1.2	1.00	1.00	1.00

SOURCE: Congressional Budget Office 1981.

[a] Standardized value added per worker hour is the level of gross product per worker hour originating in a particular industry divided by the average level for all industries. A value greater (less) than 1.00 is above (below) average.

[b] Sectors with the highest rates of growth.

TABLE 4

AVERAGES OF ANNUAL RATES OF GROWTH IN HOURS WORKED AND DISTRIBUTION OF HOURS WORKED, BY INDUSTRIAL SECTOR

Industrial Sector	Average of Annual Growth Rates (percent)			Percentage Distribution		
	1949-1965	1966-1973	1974-1978	1948-1965	1966-1973	1974-1978
Agriculture, Forestry, and Fisheries	-3.8[a]	-2.4[a]	-0.4[a]	12.2	6.3	5.6
Mining	-2.2[a]	0.1[a]	6.8	1.4	1.0	1.2
Construction	1.2	2.5	1.7	6.0	6.5	6.5
Nondurable Goods Manufacturing	0.4	0.6[a]	-0.1[a]	12.6	12.2	11.0
Durable Goods Manufacturing	1.6	1.4	0.7	16.4	17.4	16.0
Transportation	-1.0[a]	0.8	0.9	5.0	4.4	4.1
Communications	1.2	3.6	1.0[a]	1.3	1.5	1.6
Electric, Gas, and Sanitary Services	0.9	2.0	0.9	1.0	1.0	1.0
Wholesale Trade	1.5	2.4	3.1	5.3	6.0	6.7
Retail Trade	0.8	1.6	1.3	18.2	18.1	18.1
Finance, Insurance, and Real Estate	2.8	3.6	3.0	4.2	5.4	6.1
Services	2.3	2.7	3.1	16.3	20.2	22.1
Total	0.5	1.6	1.6	100.0	100.0	100.0

SOURCE: Congressional Budget Office 1981.

[a] Industrial sectors that have had the largest annual rates of decline of hours worked.

Physical Capital

Despite the fact that in recent years researchers have turned their attention to the problem of measuring capital productivity, direct and reliable estimates are currently not available (Hamlin 1981). Even so, there are two issues concerning capital stock and its relationship to productivity. The first issue is the the quantity of capital, and the second issue is the quality of capital. In the absence of reliable statistics, the rate of growth of the capital stock is used as a measure for the quantity of capital and research and development expenditures are used for a measure of quality.

In looking at the overall or total rate of growth in capital stock (table 5), the highest rates of capital formation occurred during the late sixties and early seventies, while the lowest rates of capital accumulation can be noted from 1973 to 1978. These data show that the rates of capital accumulation are nearly the same in private business, private nonfarm business, and manufacturing categories. Clearly, the highest rate of capital formation occurred in the private nonfarm business category from 1948 to the end of the 1970s.

Government regulations have a substantial bearing on the amount of capital that businesses have available for investment in their production processes. Two kinds of government regulation, economic and social, are identified by economists as having an impact on productivity. Only a brief description of each is presented as few reliable statistics are available.

Economic regulation is generally related to market structures. In particular, economic regulation deals with legislation that applies to those industries dominated by legal or natural monopolies and relates to prices charged and amounts produced. Sometimes, as in the case of the electric utilities industry, the regulatory bodies will decide that certain groups—the elderly and the sick, for example—should receive a certain portion of the output (Congressional Budget Office 1981).

TABLE 5

RATES OF GROWTH OF THE CAPITAL STOCK, INCLUDING AND EXCLUDING POLLUTION ABATEMENT CAPITAL, BY SECTOR, SELECTED PERIODS, 1948-1978
(Annual Averages, in Percent)

	1948-1965		*1965-1973*		*1973-1978*	
Sector	*Total*	*Excluding Pollution Abatement Capital*	*Total*	*Excluding Pollution Abatement Capital*	*Total*	*Excluding Pollution Abatement Capital*
Private Business	3.14	3.11	4.48	4.37	2.31	2.05
Private Nonfarm Business	3.24	3.21	4.59	4.47	2.37	2.09
Manufacturing	2.93	2.86	3.93	3.64	2.16	1.47

SOURCE: Congressional Budget Office 1981.

Social regulation deals with the impact of business on a given environment and the community. In most cases of social regulation, businesses are either regulated or constrained as to how they can combine inputs to produce outputs (Carter 1980). Legislation involving the safety and health of workers, air quality control, civil rights, equal pay, consumer protection, and age discrimination are specific examples of social regulation.

The category of pollution control expenditures is noteworthy in that expenditures in this area have not increased production in general, but have altered the way in which output is produced. It is often argued that since more inputs are required to produce the same output, productivity falls. For example, the addition of a scrubber on a smokestack requires millions of dollars of expenditure of capital; but it does not add to increased overall production.

Table 5 shows that the category of pollution control expenditures is an increasingly important factor, although pollution control expenditures are not likely to account for the overall decline in productivity in the United States in recent years. The rate of growth of capital, excluding pollution expenditures, for the 1973-1978 period was nearly half that of the 1965-1973 period. Overall capital accumulation did take a large drop during this period, but this development was not entirely due to pollution laws, as some writers have suggested.

Social regulation is more important than economic regulation with respect to the impact on productivity (Congressional Budget Office 1981). It involves a high degree of administration and considerable attention to detail. The number of workers involved in the regulation of industry can be thought of as additional inputs required for production—additions which have little impact on expansion of output.

The cost of government regulation involves more than a lower output in the private sector because of interference with the profit incentive system. In the long run, excessive regulations may have detrimental effects on business incentives, thus affecting the willingness of business to invest in new projects. Although the impact of regulation is a relatively new area of study, one current estimate indicates that from 12 to 21 percent of the slowdown in labor productivity during the years 1973-1978 is due to federal regulations (Christainsen and Haveman 1981).

Innovation and technological change are recognized by a number of writers as important factors influencing productivity. Although there are no reliable statistics that show the relationship between innovation or technological change and productivity, one indirect measure is the amount of capital expended on research and development (Dumas 1980). Research and development is an important category in two respects. In the first place, it can lead to the accumulation of additional capital. The development of new industrial or commercial processes can stimulate the demand for capital and give labor more capital support with which to do the work. In the second place, research and development generally leads to better quality capital, hence, more productive capital.

Research and development spending as a percent of gross national product (GNP) is presented in table 6. Although the amount of money devoted to research and development spending in the United States is low, the historical trend, except for 1955, is fairly consistent. The historical trend indicates that changes in levels of worker productivity are not directly related to research and development expenditures. The data on research and development expenditures are incomplete, and the relative distribution by industry of these expenditures and the resulting impact on productivity have not been thoroughly studied.

When research and development expenditures are compared on an international basis (table 7), the United States fares relatively well. In fact, only the Union of Soviet Socialist Republics

TABLE 6

RESEARCH AND DEVELOPMENT SPENDING AS A PERCENT OF GROSS NATIONAL PRODUCT, SELECTED YEARS, 1955-1978

Year	*Total*[a]
1955	1.55
1960	2.67
1965	2.91
1970	2.64
1973	2.35
1974	2.34
1975	2.32
1976	2.29
1977	2.26
1978	2.27

SOURCE: Adapted from Congressional Budget Office 1981.

[a] Includes government and private nonprofit sectors.

TABLE 7

RESEARCH AND DEVELOPMENT EXPENDITURES IN LEADING INDUSTRIAL COUNTRIES AS A PERCENT OF GROSS NATIONAL PRODUCT, 1963-1977

	1963	*1967*	*1973*	*1977*
United States	2.9	2.9	2.3	2.3
Canada	0.9	1.3	1.1	1.0
France	1.6	2.1	1.8	1.8
Germany	1.4	2.0	2.3	2.3
Japan	1.4	1.5	1.9	1.9[a]
United Kingdom	2.3[b]	2.3	2.1[c]	NA
USSR	2.8	2.9	3.7	3.5

SOURCE: Congressional Budget Office 1981.

[a] 1976

[b] 1964

[c] 1975

(USSR) devoted a larger percentage of its gross national product to research and development endeavors than did the United States in the period from 1973 to 1977. In 1977, Germany was tied with the United States, with Japan and France close behind.

Despite the consistent leadership of the United States in research and development activities, some researchers have correctly noted that the United States is losing ground to its major international competitors (National Center for Productivity 1978). In table 7, the United States is the only country with an actual decline from 1963 to 1977 in the percentage of research and development expenditures. A continuation of this trend is likely to have a serious, long-term impact on the effectiveness of labor productivity (Lawrence 1980).

Table 8 gives estimates of the effect of capital formation on productivity growth (Congressional Budget Office 1981). The figures in this table represent various estimates of productivity growth resulting both from the addition of new capital and from improvements in its quality. Although there is an overlapping of time periods studied, the estimates are relatively consistent: Denison estimated that 16 percent of the productivity growth in the 1948-1978 period was due to capital formation; Norsworthy, Harper, and Kunze estimated 25 percent; and Clark estimated a range of 16 percent to 38 percent. Although productivity growth depends upon capital formation, an increase in the quantity and quality of capital alone still will not offset the recent decline in labor productivity (Bailey 1981).

Natural Resources

Discussion in the literature of the impact of natural resources on labor productivity has been based on the view that increased prices, or shortages, have caused productivity to decline. Although statistical evidence is lacking, a number of economists have argued that recent increases in oil prices have caused structural changes in the economy that have lowered worker productivity. In the auto industry, for example, higher gas prices caused an increase in consumer demand for smaller, fuel-efficient cars. In order to meet this demand, the industry spent billions to retool. Older capital equipment, which tended to be energy inefficient, was simply phased out. Under these conditions, the addition of new capital merely takes the place of old capital—the result being that the capital stock of the industry is replaced rather than deepened (Myers 1977).

The exact impact of structural changes in the economy on worker productivity remains a matter of dispute. A recent study, for example, concluded that only .1 to .2 percentage points of the recent productivity slowdown were due to higher oil prices, although substantial and cumulative effects would be felt in later years (Perry 1977). Others (Hudson and Jorgenson 1979; Tatom 1979), however, estimated that the impact of price changes are deeper and more widespread than originally thought, and they blame oil prices for a larger share of the recent productivity decline. Few economists doubt that the increase in oil prices has had a negative effect on productivity. But the increase in prices is a relatively recent development whereas the recorded decline in productivity is not. Decline in productivity has probably been aggravated by the increased cost of energy, but the increased energy price cannot be the sole reason. The decline in productivity is clearly a deeper, long-term problem.

Human Capital

Like the stock of physical capital, both the quantity and the quality of the labor force is important. The quantity of labor, as measured by the size of the labor force, has increased slightly since the decade of the 1950s and at a relatively constant rate (table 9). Apparently, the

TABLE 8

ESTIMATES OF THE EFFECT OF CAPITAL FORMATION ON PRODUCTIVITY GROWTH, 1948-1978

Period	*Average Annual Productivity Growth (percent)*	*Productivity Growth Resulting from Capital Formation (percent)*	*Percent of Total Growth*
		(Edward F. Denison)	
1948-1953	2.83	0.48	.17
1953-1964	2.82	0.40	.14
1964-1969	1.81	0.35	.17
1969-1973	1.63	0.28	.17
1973-1978	0.31	0.13	.42
1948-1978[a]	2.08	0.34	.16
		(J.R. Norsworthy, Michael J. Harper, and Kent Kunze)	
1948-1965	3.32	0.76	.23
1965-1973	2.32	0.75	.32
1973-1978	1.20	0.21	.18
1948-1978[a]	2.70	0.67	.25
		(Peter K. Clark)	
1948:III-1955:IV	2.71	0.48 - 1.15	.18 - .42
1955:IV-1965:II	2.94	0.54 - 1.29	.18 - .44
1965:II -1973:II	2.34	0.26 - 0.62	.11 - .26
1973:II -1976:IV	1.19	0.10 - 0.25	.08 - .21
1948:III-1976:IV[a]	2.49	0.39 - 0.94	.16 - .38

SOURCE. Adapted from Congressional Budget Office 1981.

[a]These figures were calculated as time period weighted averages of the subperiod estimates.

TABLE 9

LABOR FORCE OF THE UNITED STATES, 1947-1980

YEAR	TOTAL NONINSTITUTIONAL POPULATION (in millions)	TOTAL LABOR FORCE		
		Total (in millions)	Percent	
			Of Noninstitutional Population	Of Average Annual Change
1947	103.4	60.9	58.9	(x)
1950	106.6	63.9	59.9	1.6
1955	112.7	68.1	60.4	1.3
1960	119.8	72.1	60.2	1.2
1965	129.2	77.2	59.7	1.4
1967	133.3	80.8	60.6	2.3
1968	135.6	82.3	60.7	1.9
1969	137.8	84.2	61.1	2.3
1970	140.2	85.9	61.3	2.0
1971	142.6	86.9	61.0	1.2
1972	145.8	89.0	61.0	2.4
1973	148.3	91.0	61.4	2.3
1974	150.8	93.2	61.8	2.4
1975	153.4	94.8	61.8	1.7
1976	156.0	96.9	62.1	2.2
1977	158.6	99.5	62.8	2.7
1978	161.1	102.5	63.7	3.0
1979	163.6	105.0	64.2	2.4
1980, Jan.-May	165.5	106.5	64.4	2.0

SOURCE: Statistical Abstract of the United States 1980.

problem of declining labor productivity is not due to a shortage of labor. In fact, several researchers have suggested that the opposite is true. Unless new workers are adequately prepared to enter the labor force, they will require additional on-the-job training; inadequately trained workers lower the rate of output per worker in the initial employment phase (McCarthy 1978; Kerr and Rostow 1979).

Table 10 presents projections for changes in the labor force distribution by age and sex until the year 1990. According to this projection, the category of working men over fifty-five shows the largest decrease, while the other categories remain relatively stable or show some decline. The participation of women in the labor force is expected to increase except in the sixteen- to twenty-four-year-old age bracket in 1990. In 1970, female representation in the labor force was 38.1 percent and reached 41 percent in 1977. The percentage of women in the work force is projected to reach 45.5 percent by 1990. And by that date, most working women are expected to be in the twenty-five- to fifty-four-year-old age bracket with a decline in working women over age fifty-five.

A rough measure of the quality of the labor force is the average number of school years completed (table 11). The median number of school years completed has steadily increased from 1940 to the present. By 1978, the median number had reached 12.7 years, meaning that at least half of the labor force at that time had a high school education. A general problem with measures of the quality of the labor force is that years of schooling is the most frequently used indicator for education. Unfortunately, this tends to put some distance between education and the operational measure of outputs over inputs. The effect of education on productivity is difficult to detect, let alone measure, under these circumstances (Leonor 1976).

However, a number of econometric studies have attempted to measure the contribution of education to labor force productivity (Schultz 1961; Becker 1960; Denison 1962; Ginits 1971). Although the results are mixed, it now appears as if the United States has reached the point of diminishing returns with respect to expenditures on higher public education. One recent study concluded that "to some extent, current federal policy may overemphasize higher education compared with investments in training or in secondary education" (Congressional Budget Office 1981). Even so, the increased educational level of the labor force has a significant impact on labor-management relationships. Managers are finding that better educated workers tend to have good ideas and expect to have them heard by management (Basken 1979).

A broader measure of the quality of the labor force would include the skills, health, and work efforts of labor. These factors are even more difficult to measure and have not been studied extensively by researchers. Even so, there are numerous reports from employers that attest to diminished work efforts by their employees. For example, workers who are below strength due to poor diets are simply unable to increase their productivity, even if they wish to do so. For the most part, however, the issue of food and nutrition seems to be raised in the context of international labor productivity. This line of reasoning is apparently also valid for some inner city conditions (Maturu 1979; Mach 1979). By and large, however, reliable statistics on all factors contributing to the quality of the labor force are not available (Congressional Budget Office 1981).

Besides education, skills, health, and work efforts, there are other factors that affect labor inputs. For example, excessively narrow skill or occupational jurisdictions, coupled with restrictive union practices, are also blamed for the recent decline in productivity (Perloff 1980). This is evident, for example, in the unionized building trades where one union worker—perhaps an electrician—must be called to move a wire which is in the way of a carpenter, plumber, or bricklayer who might have the skill to do the work but not the license.

TABLE 10

LABOR FORCE DISTRIBUTION, BY SEX AND AGE, 1970-1990 (In Percent)

Sex, Age	*1970*	*1977*	*1985* [a]	*1990* [a]
Men, ages 16 and over	61.9	59.0	55.8	54.6
16 to 24	11.7	13.2	11.0	9.3
25 to 54	38.7	36.7	37.0	38.4
55 and over	11.2	9.1	7.7	6.8
Women, ages 16 and over	38.1	41.0	44.2	45.5
16 to 24	9.8	11.1	10.6	9.4
25 to 54	22.0	24.3	28.7	31.6
55 and over	6.3	5.6	4.9	4.5

SOURCE: Congressional Budget Office 1981.

[a] U.S. Department of Labor, Bureau of Labor Statistics, "intermediate growth" projections.

TABLE 11

SCHOOL YEARS COMPLETED BY THE LABOR FORCE

	Percent Distribution by School Years Completed					*Median School Years Completed*
		High School		*College*		
Year	*8 or Less*	*1-3*	*4*	*1-3*	*4 or More*	
1940	49.6	18.4	19.7	6.5	5.7	9.1
1957	31.8	19.8	30.5	8.8	9.2	11.8
1965	22.0	19.4	36.4	10.6	11.7	12.2
1973	12.8	15.9	41.5	15.0	14.7	12.5
1978	9.0	13.9	41.4	17.9	17.7	12.7

SOURCE: Congressional Budget Office 1981.

Also recognized as important determinants of labor productivity are the attitudes and values of individuals regarding work, the institutions they work for, and their roles in the economic system as a whole (Gordon 1980). Work being done by some psychologists focuses on the concept of "social loafing," or the belief that productivity is affected by peer pressure when people work in groups (Latane, Williams, Harkins 1979).

Part of the blame for lower productivity has been placed on the increase in complexity of organizational structure and the degree of bureaucracy in some business enterprises (Burch 1979). Very large firms, for example, are likely to have many layers of control and complex communication systems that inhibit effective production (Thurow 1981). A variant of this view is that bureaucratic control over workers has led to absenteeism, dissatisfaction, and labor unrest. As a result, worker productivity has declined significantly. According to this school of thought, the inability of the corporate bureaucracy to stimulate worker productivity explains almost all of the decline in productivity since World War II (Gordon 1980).

Supervisory productivity—including executive attitudes, managerial behavior, supervisory skills, communication feedback, and work group norms—is another factor that, according to one researcher, is more important than labor productivity (Zenger 1976). Some companies have specifically addressed the issue of white-collar productivity as a means of increasing overall labor productivity. According to a recent report, the Xerox Corporation increased white-collar productivity by 15 to 20 percent as a result of studying and changing supervisory personnel work patterns (Cannan 1979).

STRATEGIES FOR INCREASING WORKER PRODUCTIVITY

The labor force is unique among the factors of production. While the quantity and quality of both capital and natural resources are real and critical elements, the contribution of the worker in particular, and the labor force in general, depends partly on motivation. Aside from self-motivation, workers are most influenced by the decision makers who determine the work environment and by those who prepare them for work.

The Role of Management

A significant portion of the literature on worker productivity deals with strategies and techniques to improve worker output by stimulating worker motivation and by redesigning job processes. Implementation of such strategies and techniques comes under the responsibility of management.

Theories on Stimulating Worker Motivation

Even though elements of the early motivational theories still have validity today, modern motivational techniques are aimed at the creation of workers as opposed to laborers. The emphasis is on the human side of work experience, based on the belief that productivity can be improved if the needs of the worker are adequately considered by management.

The classical theory of motivation. The "classical" theory of motivation, identified closely with Frederick W. Taylor, is one of the earliest and best-known motivational approaches. Basically, workers are perceived to be purely economic individuals who respond to higher wages in the work place (Certo 1980). Taylor believed in the division of labor and advocated the breakdown of production into smaller and smaller tasks which were repetitive in nature and, more importantly, could be measured. A reasonable level of output was established for each worker and quotas were assigned. Piecework incentives were then introduced to give the workers an incentive to surpass their quotas.

At the turn of the century, the Bethlehem Steel Works used the quota and piecework system with dramatic success. Wages increased by over 60 percent while some costs of production fell by more than half (Rachman and Mescon 1979). Today, the quota and piecework system of motivation is firmly ingrained in some parts of American industry.

The Hawthorne studies. In the late twenties, Elton Mayo of Harvard University conducted a number of studies at Western Electric's Hawthorne plant in Chicago. The intent was to determine the impact of the work environment on labor productivity. The experiments dealt in part with the impact of lighting on the productivity of workers. Each day, the lights were made brighter and productivity went up. However, productivity also went up when the lights were dimmed—a development that caused some confusion during the early phases of the study. Finally, the

researchers surmised that the increased productivity was due to the attention received by the workers and concluded that social factors—social pressure from peers, for example—were important elements in the work setting (Rachman and Mescon 1979).

Maslow's Hierarchy. Abraham Maslow's work on motivation has added to the understanding of the psychological aspect of worker productivity. His work, known today as "Maslow's Hierarchy," identified five steps in a hierarchy of needs: physiological, safety, social, esteem, and self-realization (Maslow 1970). According to Maslow, individuals satisfy their needs in a sequential manner. The motivation for individuals to achieve higher goals depends on their desire to fulfill those needs not satisfied. Once a person reaches a stage where his or her physiological needs (basic necessities for survival) are fulfilled, he or she would then turn toward safety needs. When this level of need was satisfied, social needs would follow, and so on up the hierarchy (Rachman and Mescon 1979).

Theory X and Theory Y. In 1960, Douglas McGregor (1960) put forth his theories of motivation which he called Theory X and Theory Y. Basically, each theory represents the way management views the worker. According to McGregor, many managers view workers as work-avoiders who must be controlled or directed because of their lack of ambition. Theory X applies to this group of workers. A tough, demanding boss is required to motivate this group of people to work. This view, however, assumes that the worker only has needs at the psychological and safety levels on Maslow's hierarchy. Since some, if not many, workers are likely to have social, esteem, and even self-realization needs, a Theory X type of management is not likely to be appropriate or very effective.

The alternative is Theory Y, which assumes that people may actually like, or at least not dislike, work. This view holds that punishment is not always the way to motivate workers and achieve goals. A person's commitment, willingness to accept authority, imagination, and intellectual potential are all factors which, if tapped by the manager, could help motivate the worker (Rachman and Mescon 1979).

Behavior modification. Behavior modification assumes that people's behavior can be improved with rewards such as praise, a pat on the back, or a supportive work environment. The method was popularized by Harvard psychologist B. F. Skinner and is receiving increasing attention in today's business environment. Although many managers reject the approach as too simplistic and too obvious to be effective, those who have worked with it claim positive results ("Productivity Gains" 1978).

In practice, behavior modification amounts to more than a pat on the back. In a typical situation, meetings between the worker and management are held to identify and define the mutual needs and problems. The second step is for the manager to observe the worker in the work environment to determine levels of performance. The third involves feedback from managers, which involves both informing the workers of their progress and praising them ("Productivity Gains" 1978).

Strategies for Redesigning Job Processes

To a certain extent, a number of management tools—management by objectives, job enlargement and enrichment, flexible working hours, and quality circles—are all innovations that can be used to make labor more productive.

Management by objectives. Under a management by objectives (MBO) system, workers and management meet on a periodic basis to define goals for a given time period. Both management and workers state their goals and, in a process of review, resolve any differences. The purpose of the process is to communicate the goals of the organization to the workers and help the workers accept the goals of the organization as their own (Gordon 1980).

Whether the system works depends on a number of factors, not the least of which is the assumption that the workers actually accept the goals and are capable of achieving them. In addition, the system works best in an environment where the participants are goal-conscious and interested in self-advancement (usually in a professional sense). The drawback is that the system is demanding on resources—meetings must be held and reports must be prepared and reviewed periodically. In spite of these drawbacks, there are many strong adherents to the MBO system. Individuals generally have an opportunity to learn where they stand and are forced to think about the goals of the organization (Rachman and Mescon 1979).

Job enlargement and enrichment. The trend toward job enlargement and job enrichment is a reversal of the historical trend toward increasing degrees of specialization. Job enlargement may give the worker greater responsibility by increasing the number of tasks that are performed, or the worker may be given the responsibility for every task required to finish the entire product (Certo 1980).

Some experimentation with job enlargement is occurring today in the auto industry. Typically, each worker stands at a single station and performs one or two simple tasks. Now, some assembly operations have been organized so that a team of workers follows a single automobile through the entire assembly process. The advantage is that it can give workers feelings of ownership and pride in their product since they are responsible for most of the total assembly. The disadvantage of this approach is the degree of complexity involved. Workers must learn several tasks and cannot be easily replaced when one of the team members is absent.

Job enrichment is a topic closely related to job enlargement. According to research done by Frederick Herzberg, job enrichment, or the degree of satisfaction felt by workers, is due to a combination of motivational and hygiene or maintenance factors. Hygiene factors include many of the same characteristics of job enlargement and motivational factors include recognition, growth and learning, responsibility, and advancement. In order for a worker to be productive, according to Herzberg, the work environment must supply both factors (Certo 1980).

Flexible working hours. Several strategies have been used to alter work conditions to make them more attractive to the worker. One strategy some businesses use to accommodate the worker and to motivate behavior is to make the workday schedule more flexible. Basically, there are three major categories under the heading of flexible working hours: flexitime, staggered hours, and variable hours.

Under a flexitime system, there usually is a two- to three-hour period at the beginning of the workday during which the worker may arrive at the work place. The departure time depends on the starting time and the amount of time taken for lunch, but basically the worker is able to leave after the designated work period is completed. The key to this system is that all workers are present at key or core times of the day for meetings, rush periods, or other requirements of business (Levitan, Magnum, and Marshall 1981). The federal government, one of the nation's largest employers, has been experimenting with flexitime during the last three years. According to the Civil Service Commission that is monitoring the experiment, productivity increases of 2 to 5 percent are fairly typical ("Federal Employees" 1977).

Under staggered work hours, the time of arrival and departure is fixed for each worker but may vary from worker to worker. One may choose to arrive at 9 a.m. on a regular basis, and another at 7 a.m., but in each case the daily schedule remains the same for the respective worker.

Under a system of variable hours, workers are free to come and go whenever they desire. A worker may put in five, eight-hour days using a combination of morning, afternoon, and evening hours, or may vary the amount of hours from one day to the next. The difference between the variable hours schedule and the flexitime program is that the latter requires all workers to be present at "core" times during the day, and the former does not.

The concept of flexible working time is gaining in America (Levitan, Mangum, and Marshall 1981). It is popular with workers because it allows them to work at times that do not conflict with their personal schedules. Women who have young children can work a few hours a week after the children go to school. Students can arrange to take classes and squeeze in a full- or part-time job around the ever-changing class schedule. Fire fighters and police officers who take second jobs can work around their station shifts.

Yet another strategy has been to change the typical five-day-a-week work schedule. The four-day workweek was introduced in the early seventies. The movement was given an initial boost by the increase in oil prices that made transportation to and from the workplace more expensive. There is a large body of literature on the acceptance and value of the four-day workweek and problems associated with its development. Research seems to indicate that with the exception of professions where heavy labor and physical fatigue are involved, the four-day week has a marginally favorable impact on worker productivity (Calvasina and Boxx 1975).

Because of the tedious nature of work on assembly lines, some companies have introduced the strategy of job rotation; that is, a worker will work for a while at one station and then will spend time at another (Levitan, Mangum, and Marshall 1981). Job rotation has several advantages. In the first place, workers are less likely to be bored if they are faced with new challenges from time to time. In the second place, it helps workers understand problems in other parts of the assembly process. If they work at the next station down the line, the result is a better understanding of the problems that result when work is poorly done at a previous location.

Quality circles. Quality circles are one of the newer and apparently one of the more promising approaches to improving productivity. Generally speaking, the use of quality control circles, or QCCs as they are sometimes called, represents a "grassroots" approach to productivity enhancement (Lindsay 1981). QCC teams are usually made up of eight to twelve workers who elect their own leader or coordinator and who represent a particular aspect of a production process. Each team is given instruction in presentation techniques and problem analysis. The task of the team is to identify a problem, analyze it, and make a presentation to upper level managers on both the importance of solving the problem and the solution they propose. In the typical quality circle, the managers then have the responsibility for accepting the proposed solution or simply rejecting it. The success of the technique depends on a mutual trust existing between the team and management (Lindsay 1981).

Interestingly enough, the concept of quality circles is coming to America from Japan where it was introduced by two Americans, W. Edward Deming and J. M. Juran. The renewed American interest in QCCs stems in large part from the productivity gains made by Japanese industry in recent years.

The Role of Vocational Education

Several factors detrimental to the growth of worker productivity have been identified in this paper. One factor has been the growth in the labor force that, since World War II, has tended to dilute the ratio of capital to labor so that each worker has less capital support with which to get the job done. This addition to the work force has tended to be young and unskilled workers.

Changes in the composition of the labor force are of vital interest to vocational education planners. Projections indicate that in general the work force is aging, and the labor force is likely to be augmented somewhat by immigrants—both legal and illegal—as well as by handicapped and economically disadvantaged individuals. Also important to planners are emerging patterns that relate to the way in which workers change jobs and occupations. For example, in 1980 almost 30 percent of all workers held their current job for one year or less, while approximately 50 percent had been in the same job for three years or less (Ragan 1981). Most of the literature on worker productivity seems to be based on the assumption that older workers are more skilled and better trained. If, however, these same workers change occupations with a regular frequency, they will cause the same problems in worker productivity as the unskilled workers entering the work force for the first time (Worthington 1981).

Historically, vocational education has played an important role in response to the changing educational and economic needs of the citizens and the nation. Dr. Howard F. Hjelm, director, Division of National Vocational Programs at the U. S. Department of Education, said in a June 1981 speech that vocational education will face a most challenging and exciting decade. This challenge in the 1980s will be because of:

- The advent of high technology and the need for highly skilled workers
- A continuation of the shift from labor intensive to capital intensive production methods
- The increasingly frequent need for skill updating and job retraining
- The aging of the population at large and the work force in particular
- The reemphasis of entrepreneurship that has accompanied the recognition that small businesses are the greatest job creators as well as major sources of innovation in this country.

Facing these challenges will provide vocational education with tremendous opportunities. I am optimistic because I feel that the delivery systems needed to cope with these challenges are already in place. This will be an era in which vocational educators will expand efforts in areas where they have been working already.

At an international conference on education, Robert Worthington (1981), assistant secretary for vocational and adult education, U. S. Department of Education, offered the following development ideas for meeting the challenges of the 1980s:

- In response to greater skill requirements, there will be more emphasis placed on technical education in postsecondary institutions and community colleges, with new forms of support from interested businesses and industries—especially in the joint use of expensive equipment.

- While private employers will increase their own training efforts—particularly in new ways that retrain older or retired workers—they will also increasingly see the need for strong publicly-supported vocational education as an indispensable source of new entry-level skilled workers; and, similarly, the colleges of science and engineering for highly skilled professionals. Rather than hiring the best professionals away from these institutions, private employers and schools and colleges will develop new teacher-worker exchange programs for their mutual benefit. The whole concept of teacher education for vocational and technical education will need to be broadened and expanded. . .

- Because of economic pressures, vocational institutions at all levels will become much more closely tied to business and industry. Traditional apprenticeship will see a rebirth and cooperative education programs will flourish, but fiscal constraints will necessitate new arrangements and organizational structures. For example: vocational schools, staffed jointly by publicly and privately employed teachers, will be established at business-industry sites; and, building on the existing models of private industry councils and industry-education-labor collaboratives, new kinds of public corporations will be created to administer education training with a combination of public and private funds.

- Vocational education in rural areas must be given equal attention to that in urbanized, economically developed areas. The high productivity of American agriculture is due in a large part to the more than 500,000 youth and adults enrolled in vocational agriculture. These programs are based on a daily relationship between in-school education and work in agriculture.

- Finally, economic needs may well accomplish what social pressures have only begun—achieving equal educational opportunity for special needs populations. In a growing economy faced with an aging, shrinking work force, all potential sources of skilled workers must be tapped. New kinds of programs for the disadvantaged, the handicapped, and the limited-English proficient will be created, with strong private-sector backing, to recruit and prepare such students.

In planning for such developments, Thomas Miller of Control Data Corporation, in a January 1981 address to the staff of the National Center for Research in Vocational Education, advocated the following:

- Vocational education must present itself competitively, like any other product in the marketplace. . . Not only must vocational education respond to the private sector's need for increased productivity, it must increase its own. The way to do that is through the introduction of innovation and technology into the learning process.

- Vocational education must constantly ask itself, "Where is the payoff?" We cannot be training auto mechanics when industry needs computer technicians. We have to invest in tomorrow's jobs, not yesterday's. Part of the responsibility for this lies with industry. We have to perceive and articulate our own needs clearly. We both have to communicate.

Attention must be paid in the future to the way that work is done as well as to the technical skills needed to accomplish it. For instance, if managers employ work strategies based on quality circles or management by objectives; then new and retrained workers must have some preparation along those lines. The challenges to vocational educators will be to infuse communication and task-related decision-making skills into occupational curricula and to keep those curricula up-to-date.

Another way that vocational education can have an impact on the quality of human capital is by helping students develop positive attitudes toward work (Leach 1981). This is consistent with the views of other writers that job satisfaction is related to productivity (Mortimer 1979). To the extent that vocational education can help workers find appropriate occupations and feel comfortable with them because of the competence they gain beforehand, worker productivity will be enhanced (Leach 1981; Miller 1982).

SUMMARY AND CONCLUSIONS

The prognosis for productivity improvement is mixed. Productivity improvements, where recorded, exist as isolated examples that have done little to improve the performance figures for the national economy as a whole. And recent claims that productivity gains in the service sector are equal to or greater than those of manufacturing do not hold up under the weight of recent statistical evidence. The productivity picture is such that many observers are concerned that the quality of life in America is threatened (Brown and Johnson 1980).

There seems, though, to be an emerging opinion that workers in America do work hard and that the work ethic is not dead (Flint 1981). But knowing how to capitalize on that is a major problem. The issue of worker productivity is necessarily complex. It involves issues related to its definition, current trends, and specific determinants. The main determinants are the three factors of production—physical capital, natural resources, and labor. The labor factor is perhaps the most important because it is the one factor that has the capacity to be motivated. Despite the extensive literature on the topic of worker productivity, it will still be argued that the dynamics are only vaguely understood. Even with meaningful contributions, worker productivity in the aggregate is still on the decline—a consistent trend since the end of World War II.

Despite the enormous amount of literature on the topic of worker productivity, little research has been done on the specific contribution of the worker. Individual studies tend to report isolated instances in which productivity went up because of selected programs or new procedures, but the question of what the aggregate contribution of the worker is in the productivity equation remains unanswered. Even the literature on motivational theory is long on prescription and short on measurable results.

A problem with the motivational literature is that it seems to start with the bias that the worker is operating at less than optimal efficiency and that there is always room for improvement. This is a consideration because productivity is a measure of growth, not a measure of the level of performance. The motivational techniques described in the literature may help to bring a worker to maximum effectiveness, but for continued productivity improvements to take place, this maximum effectiveness must grow at some given rate from one year to the next. In short, motivation factors may have initial impacts on productivity growth, but the question remains as to whether or not they can have any continued impact on productivity once workers are fully motivated.

In a sense, the term "worker productivity" is a misnomer. Labor inputs are affected by both capital and natural resource inputs. Most studies deal with the contribution of capital to worker productivity. Less is known about the contribution of natural resources, but there is a growing awareness of the importance of the topic. The contribution of the human capital component of the equation is a matter of dispute. Some studies conclude that education is marginally important, but that its contribution is difficult to measure. Others have concluded that the major portion of productivity increases is due to education.

In short, we have a productivity equation in which the whole is greater than the sum of the parts: existing research indicates that capital may contribute around 25 percent; the contribution

of natural resources is unknown; and the contribution of the human capital element is a matter of dispute. Even so, productivity is defined as the rate of growth of output per unit of labor input.

One of the pressing needs in the study of worker productivity is a better understanding of the role of other factors as they relate to productivity changes and trends. Unfortunately, most measures of productivity implicitly assume that underlying structural changes are not taking place. When changes do occur, they can affect the productivity figures in a way that is difficult to measure. How, for example, is productivity affected by the changing age distribution of the population or by immigration changes? In addition, some structural changes such as the increase in oil prices during the seventies are often difficult to predict—the result being that they may have sudden and unforeseen consequences.

Labor cannot be held solely responsible for the decline in productivity, nor can it take full credit for increases when they occur. An encouraging development is the emerging view that management is at least partially, if not mostly, responsible for productivity declines or improvements. This may explain some of the increased attention recently given to the topic of supervisory productivity. Where much of the behavioral literature is focused on getting more out of the worker, this approach is concerned with having management get more out of itself. In doing so, management seems to be accepting more of the responsibility for the way in which it combines inputs to get outputs (Eisenberg 1980).

A key to the improvement of combining inputs is the use of innovation. Managers can implement procedures that are conducive to creativity and innovation. Often organizations have been structured to avoid the perceived risks of creativity and creative people (Gryskiewicz 1981). This is unfortunate because innovations are likely to have as great an impact on worker productivity as technological change. While the latter provides the worker with better tools with which to work, innovation deals with the way in which things are done, the new and better methods which can be used to stimulate the work force.

Vocational education plays an important role in the overall productivity picture primarily because it enriches the quality of human capital. Its role is strengthened by the finding that education in general, as measured in terms of the number of school years completed, has reached the point of diminishing returns. If vocational education successfully meets the challenges of preparing people for work in the 1980s, new workers will enter the work force with the skills and attitudes needed to succeed. In addition, workers who change jobs will be able to obtain skills needed to enter new occupations where they perceive the motivational and environmental features to be more appealing. Such efforts on the part of vocational education will not only offer individuals growth and satisfaction, but will also contribute to the enhancement of worker productivity which in turn will strengthen the nation's economic well-being.

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