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# Cybernetics and its Influence Upon Vocations

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# CYBERNETICS AND ITS INFLUENCE UPON VOCATIONS

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# FOREWORD

The word cybernation is not one that is familiar to most people in personnel and guidance. It is a word that hides its own ominousness behind its own sematics. Cybernation is becoming more and more firmly entrenched in our lives everyday. In twenty years, the United States will probably have become so dependent on cybernetics, indeed if it is not already, that this country could not exist without it. What is cybernetics? How does it apply to the personnel worker and his counselee of today and tomorrow? These are some of the questions this paper proposes to examine in the following pages. However, before any type of inspection can be made, it must be set forth that this paper makes some rather arbitrary assumptions concerning the state of economics in the United States in the next ten to twenty years:

1. International relations will derive from the same general conditions that pertain today.
2. Weapons systems will constitute a major part of the economy.
3. Major discoveries will be made and applied in other technologies including psychology and medicine.
4. Trends in megalopolis living and population growth will continue.
5. Some shifting in underlying social attitudes and public and private goals will take place.

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# CHAPTER I

## INTRODUCTION TO CYBERNETICS

The purpose of this paper is to take the concept of cybernetics and examine this interdisciplinary science in the context of the guidance counselor. To do this, the field of guidance is going to have to be seen in a dual perspective. First, the guidance counselor will have to be seen as a separate entity in the field of vocational counseling. As this paper will try to illustrate, the vocational counselor of the future is going to have to be much more than a counselor of occupations. Because of the vast changes that are going to overtake society in the next twenty years, vocational counseling will have to become integrated with the physical and natural sciences, the space and earth sciences, the social sciences, law, medicine, art, music and, in fact, "everything." This "everything" will create tremendous problems for the counselor for he is going to have to be dualistic enough to see occupational guidance as an entity itself.[1] This does not mean the counselor will become a cyclopedia of facts and knowledge. It should also be recognized that "everything" will not make the counselor proficient in all of these fields. What it does mean is that the counselor should be able to use his knowledge to gain a better perspective of his own profession.

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[1]Regis J. Leonard, "Guidance in 1975," The Journal of Educational Sociology, XXXV (June, 1963), 229-36.

Rapid social, scientific and economic progress belongs to a small part of recorded history. For most past generations the world was not a place in which enduring happiness was to be expected since prevailing theological philosophies prescribed that man should expect nothing more from life than travail. This has been true in the Catholic, Protestant and Jewish faiths since their inception.[2] Thus progress and change were, in the real world, secondary to the expectations that people held for the hereafter. Life was only transitory. Therefore, there was no need to disturb the status quo.

This was not only true of religion, but also of the rest of society. The muskets of the Civil War were much like those of the Revolutionary War, and those in fact, were hardly different from the Brown Bess that Marlborough's armies used in the low countries.[3] The same is true of the Roman deckhand on a galley who would find himself quite at home in the forecastle of one of Joseph Conrad's sailing vessels.[4]

What many people fail to realize, and the guidance counselor can not be exempted from this, is that the last one hundred and fifty years has become a specialized period of history in the world. The pace at which changes have occurred, and

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[2]Norbert Wiener, The Human Use of Human Beings: Cybernetics and Society (Boston: Houghton Mifflin Co., 1954), pp. 42-44.

[3]Ibid., p. 44.

[4]Ibid.

progress has been made, in this period, have been unsurpassed and unexampled in all of previous recorded history.[5] This has been due not only to increased communication, but also to an increased mastery over nature.

However, even in this period of change, man's ideas have been linked to the past. He has not, as Seneca said, been able to enjoy nature's resources and at the same time preserve them for future generations. He has exploited the resources of the land with little thought of the future. Mankind has been much like the Mad Hatter and the March Hare in Alice in Wonderland. In devouring the tea and cakes that were spread out around the table, their only objective was to move on to the next plate on the table when they had finished the previous one. When Alice inquired what happened when they came around to their original position again, they immediately changed the subject. This is a classic example of man's past folly of seeing the world in the old theological terms. That is, not as a continum to be perpetuated and preserved for future members of society, but as a world which, with the final judgment day just around the corner, should be reaped to the fullest extent. Yet, the resources of America have proven not to be

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[5] Ibid., p. 46.

inexhaustible.[6]

However, society has always been slow to recognize the importance of change. While man always seems to be in a stage of transition from one state to another, he has still not become aware that these stages are usually part of the normal process of evolution.[7] Indeed, successful methods which are outmoded in our society have a stubborn tenacity for being removed. Even when the lack of success of an outmoded practice begins to be apparent to individuals within society, the success of the method has, nevertheless, been indelibly written in the minds of the majority and is, therefore extremely difficult to purge from the society.[8] Society tends to oppose change so highly, that even though it may be technically possible to bring in new and better processes, they will generally be harmful unless the people are ready and willing to accept them as beneficial.[9]

A case in point is the displacement and removal to the southern states of the New England textile mills. Aside from the difficulties of having relatively strict industrial laws and an un-advanced labor policy, the main reason that New England is being deserted by the textile industry is that

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[6] Ibid.

[7] F. H. George, Automation, Cybernetics and Society (New York: Philosophical Library Inc.), p. 7.

[8] Ibid., p. 276.

[9] Ibid., p. 9.

they prefer not to be hampered by traditions.[10]

Tradition, though, is fast becoming obsolescent in the world of economics. Automation and its more sophisticated offspring, cybernation, are speeding up economic and social changes. Without these changes, our society may become bankrupt by lack of competitive power in the economic world.[11] Certainly the great difference between the various ages that preceded automation and cybernetics is that change and progress could be examined and instituted at man's leisure. However, this ceased to be true with the advent of the digital computer which is important not only for its intrinsic effect, but also because it brings so many problems so rapidly to mankind's attention that change has to be made.[12]

A specific example of the rapidity with which innovations in computer technology spring upon society seems cogent here. In his book Automatic Language Translation, published in 1960, A. G. Oettinger stated that while several rules for producing smooth Russian-English translations had been proposed in literature, published experimental results were conspicuously absent.[13]

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[10] Wiener, p. 121.

[11] George, p. 42.

[12] Ibid., p. 273.

[13] A. G. Oettinger, Automatic Language Translation (Cambridge, Mass: Harvard University Press, 1960), p. 346.

Not two years later, D. A. Bell was able to report in his book Intelligent Machines that theorists in the machine translation of languages had a workable program which could translate hundreds of pages of Russian scientific thought into English per hour.[14] Thus, in a mere two years time, a problem that appeared quite difficult to solve was removed from the realm of debate and put into actual practice.

The guidance counselor must become aware of the tremendous momentum that automation and cybernetics has engendered in the society through the innovation of the digital computer. The progress that is being made in this area promises to open up whole new vistas for the future. Along with these vast panoramic changes there will also be new restrictions. Society, like it or not, has placed itself on the vehicle of cybernetics which is just starting on a downhill track. As this vehicle picks up speed, society has no choice, because of the increasing population, but to go along for the ride if the standard of living is to remain as it is.[15]

Can mankind avoid the standardization that seems to be implied? Does mankind wish to avoid it? Should it be encouraged? How will individual freedom be affected? What will the

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[14] D. A. Bell, Intelligent Machines: An Introduction to Cybernetics (New York: Blaisdell Publishing Co., 1962), p. 37.

[15] Pierre de Latil, Thinking by Machine: A Study of Cybernetics, trans. Y. M. Golla (Boston: Houghton Mifflin Co., 1957), p. v.

effects be on employment and industry? How will sociological and economic institutions be affected? How will educational systems change? These questions are highly pertinent to the guidance counselor. However, they should be held in abeyance until a complete understanding can be obtained of what cybernetics is and how it is so radically different from automation.

There will probably be no termination of cybernetics in the future. Thus, the guidance counselor should make himself aware of the possibilities, both positive and negative, that cybernetics holds for the future. This is a crusade upon which the vocational counselor, along with other personnel in related fields of employment, should be prepared to embark; for there is probably not one other goal that is so concomitant or so highly related to the future as that of helping society adjust itself to the implications that a cybernocracy holds for mankind. This, then is of the paramount importance to the guidance counselor; for, like any other warrior girding himself to do battle with his enemy, the counselor must know the underlying philosophy of his opponent before he can work out a strategem of his own that will result in an ultimate victory. The next chapter of this paper will attempt to define at some length what cybernetics is.

## CHAPTER II

## CYBERNETICS DEFINED

Any attempt to define a word that has so many and different meanings should, it seems, start by delving into the origin and etymological root of the word. This is especially cogent for the guidance counselor, who, by obtaining an overview of the word cybernetics may be more readily able to see the bearing that it has upon the many fields of endeavor. Furthermore, the counselor may then decide for himself which definitions of cybernetics are applicable to himself and future clients that he may counsel.

Inspection of the earliest root of the word "cybernetics" finds it was first used in the classical Greek κυβερνητικός. It might be argued that control is its essential feature.[1] However, this would be a somewhat metaphorical use of the word, since its actual meaning in the original was nautical and meant the art of steermanship.[2] The word itself comes from a large group of words deriving from the Greek technai which is inclusive of medicine, education, poetry, mathematics, and mechanics.[3] From Greek, the word changed to the Latin Gubernaculum, helm, and gubernator, a helmsman. In the Latin vernacular it often carried the meaning of a helmsman steering the ship of state.[4]

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[1] Bell, p. 27.

[2] G. T. Guilbaud, What is Cybernetics? trans. Valerie MacKay (New York: Criterion Books, 1959), p. 1.

[3] Ibid.

[4] Ibid.

From Latin the word may be traced down to the French "gouvernail," a rudder. But, for the most part, the word had lost its nautical meaning and implied the political functions of state.[5]

However, the word "governor" regained its mechanical prominence in 1790 with the invention, by James Watt, of a fly ball valve to govern the speed of retation in a steam engine.[6] The word was again lost in context until 1834 when Ampere wrote his Philosophy of the Sciences in which he attempted to classify the whole of human knowledge. He classified the meaning of government in the Greek *Kybernētikē* into the French "cybernetique."[7]

The word cybernetics, as it is known in the contemporary sense, was coined by Norbert Weiner, a Massachusetts Institute of Technology mathematician, in 1948. He and many fellow scientists whom he had met during the war were trying to find a common vocabulary so that scientists from all realms and fields could be able to understand one another.[8] Finally, the word appeared in the title of Weiner's first book, Cybernetics, or Control and Communication in the Animal and the Machine.

However, the adjectival use of the word has become so

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[5] Ibid. pp. 1-2

[6] Ibid. p. 2.

[7] Ibid.

[8] deLatil, p. 14.

bastardized that today the word finds itself associated with robots, electronics, and giant brains. Its misuse by uninformed laymen threatens to relegate the word to the category of "atomic" and "electronic" which are, at present, merely labels for the spectacular and have no real meaning.[9]

Any attempt to lend one set, specific definition to the term cybernetics will run afoul of semantics. This is true because cybernetics is so different as to be a separate entity that is at the head of many different disciplines in science. Cybernetics is a revolution in science which promotes a change of outlook, a re-evaluation of concepts both old and new, and various forms and types of creative thinking.[10]

Applications of cybernetics involve every aspect of life from the biological to the social.[11] Cybernetical applications can be found in all phases of engineering, biological sciences, physiology, psychology, communications, and economics. Cybernetics is not essentially the theory of electronic machines, calculating machines, or automatic machines. It is an overview of, and an attempt to, co-ordinate and re-examine lines of research in the forementioned fields that had formerly been pursued in isolation.[12] It can, and indeed should, be given

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[9] Guilbaud, p. 3.

[10] Ibid., p. 1.

[11] George, p. 1.

[12] Guilbaud, p. 4.

its overall definition as the crossroads of science.

What is one to expect from this rather all-encompassing definition? Essentially, in the re-organization of society for the future, each separate discipline must somehow be integrated effectively into a workable polymorph that has some sense of organization and pursuit of ultimate goals. This is the raison d'etre of cybernetics; a common ground where different disciplines can have an effective exchange of ideas that will be mutually beneficial.[13]

However, there is no assumption upon the part of cybernetics or its originators that it is some sort of many-headed Hydra that holds dominion over all sciences. Cybernetics has no need nor intention of becoming a super-science.[14] In borrowing problems from all fields, cyberneticians hope that the solutions they discover may have some useful application, but this is not taken foregranted by the men in the field.[15] For this very reason, the use of the word cybernetics has met with verbal barrages from many of the scientific fields on which it impinges. It has not met with universal approval because it specifically does not delineate a whole field of endeavor. It encompasses many apparently diverse fields.[16]

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[13] Ibid., p. 5.

[14] Ibid.,

[15] Ibid., pp. 5-6.

[16] George, p. 45.

While cybernetics can be classified as a science dealing with and integrating all other sciences, it is most important to the guidance counselor in three specific areas:

1. As in guiding mechanisms; words like "regulator."
2. As in man-to-machine relationships.
3. As in societies which guide themselves.[17]

In depicting the importance of these three areas, it is first necessary to see that the concept of guiding mechanisms could not function in the modern context if it were not for the new theories involving man-to-machine relationships. All the philosophies and the resulting designs for automatic control have evolved from Norbert Weiner's book, Cybernetics, Control and Communication in the Animal and Man. In this book, Weiner attempted a definition of control and communications systems. This whole theory of communication and control was based on the human organism within its physiological, psychological, and neurological framework. Weiner thus saw the human operator as a well constructed machine.[18]

In designing computers for automatic control, it has become a basic postulate that massive analogies of control functions exist between men and machines. Thus, the design of machine controls can constitute a contribution to both the

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[17] Guilbaud, p. 4.

[18] George, p. 21.

understanding and design of machines and men.[19] Using this theory, systems engineers have designed overall systems with sense organs, effectors, and proprioceptors.[20] Certainly no generalization can be made after systems engineers originally planned to shape automatic control systems in the form of human beings. However, to perform some definite task or tasks, it became necessary that automatic control systems have effector organs analogous to arms and legs with which to perform indigenous functions.[21]

The second point is that automatic control systems must be in direct rapport with the outside world by use of sense organs.[22] This concept is also called feedback which is the property of being able to adjust future conduct by past performance, and will be defined more extensively later on in the chapter.

Thus, cybernetics takes the view that the structure of the machine or the organism is an index of the performance that may be expected from it. The degree of rigidity or fluidity that is fixed in a cybernetical system is the degree to which it will either be limited in its intelligence and ability to perform intelligent functions, much as the rigidity of the insect's exo-skeleton limits its intelligence, or whether it

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[18] George, p. 21.

[19] Mortimer Taube, Computers and Common Sense; The Myth of Thinking Machines (New York: Columbia University Press, 1961) p. 126.

[20] Weiner, p. 157.

[21] Ibid., pp. 32-33

[22] Ibid.

will have almost limitless capability for intellectual expansion, as in the case of human beings.[23] Therefore, although systems engineers are not too concerned with building an automatic control system which duplicates the human physique, nevertheless, a machine that could duplicate the fluidity of human beings could easily have concomitant intellectual capacities as well.[24]

It should be apparent that cybernetics can no more be defined as, in the ultra-rapid computing machine, an isolated brain, dependent for its experiences and its effectiveness on man's constant intervention than it can be defined as automation, as in the case of a machine lathe.[25] Cybernetics is the incorporation of these two separate entities. The automatic control system can be thought of as a machine's brain which has mated with a machine's muscles of the industrial revolution to produce the cybernetical revolution.

Thus, in constructing a cybernetic system, Weiner and his associates have tried to correlate machine functions with those of the human body for the reason that the human body is an excellent piece of machinery itself. The resulting struggle to accomplish this feat has been no small task.

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[23] Ibid., p. 57.

[24] Ibid.

[25] Ibid., p. 157.

For a long time these ideas were only theoretical with little practical application involved. Critics of cybernetics were sometimes quite caustic in reviews of work done in the field. Mortimer Taube's criticism is an especially vitriolic example:

> There are in the literature on technical translation, learning machines, automation, etc., a great many names of non-existent machines whose operations are described and debated as though they were real. The whole performance takes on the character of The Emperor's New Clothes. 26

In 1960 Taube's criticism was probably justified. Although there were effectors, automatic machines to do the work; sensors--servo-mechanisms to carry messages; and reactors, large computers to give commands; integrating them into a cybernetical system of communication and control had not been achieved to any great degree.

The giant computer existed at that time, but it would have been as ridiculous to call it a giant brain as it would have been to call a forging hammer a giant fist. The computer by itself had neither the ability to exert any influence outside its own environment nor adapt to any change in its external situations involved systems engineering problems of the first magnitude. However, these problems have been overcome and many of the theories of six years ago have become realities today.

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[26] Taube, pp. 120-121.

Until this decade, every machine that was automatic lay within the domain of automation. However, while automation is still concerned with the development of intricate machinery which is capable of many and varied degrees of control, it is now an application of the field known as cybernetics which in turn is referred to as the science of communication and control. Thus, from this time forward, it must be remembered that when automation is referred to in this paper, it is not as a separate entity but as an application of cybernetics.

To better differentiate what the degree of automation is in certain types of machines and where it applies to cybernetics, George and Paul Amber have formulated the following degrees of automation:

$A_0$ = Hand tools and manual machines.

$A_1$ = Powered machines and tools.

$A_3$ = Automatic machines such as player pianos.

$A_4$ = Self measuring and adjusting machines such as furnace thermostats.

$A_5$ = Computer controlled machines such as automatic power plants.

$A_6$ = Limited self programing (self learning machines such as the mock turtle at M. I. T.)

$A_7$ = Machines that relate cause and effect--intuitive machines. There is the possibility of an un-programmed automatic chess playing machine.

$A_8$ = Machines that exhibit originality and high level certainty. These exist at present only in abstract theory.

$A_9$ = Machines that command or control with high levels of originality--at present best described in science fiction. [27]

Of the nine different categories that are listed, $A_5$, $A_6$, and $A_7$ are now in various phases of theoretical and applied use in cybernetic systems. Categories $A_0$, $A_1$, $A_2$, $A_3$, and $A_4$ are automatic machines controlled to some degree by man. However, when these latter machine categories are coupled to sensor devices such as photo-electric cells, condensors, thermometers, gamma ray deflectors, and hydrogen-ion concentrators, the sensor organs send detailed information to any one of the digital computers in the $A_5$, $A_6$, and $A_7$ range which is returned to and affected by the $A_0$, $A_1$, $A_2$, $A_3$, and $A_4$ class machines. Thus, the computer is the center of the automatic control system, but without its sensors and effectors, it is not a cybernetic system, merely an automatic one. In the technical sense Weiner explains feedback as the control of a machine on the basis of its actual performance rather than its

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[27] George H. Amber and Paul S. Amber, Anatomy of Automation (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1962), p. 48.

expected performance. The theory of feedback involves sensory members which are actuated by motor members and perform the function of tell-tales or monitors. It is the function of these mechanisms to control the mechanical tendency toward disorganization. In other words, the function of the feedback system is to produce a temporary and local reversal of the normal direction of entropy.[28]

In a layman's analogy, feedback may be as simple as that of the common reflex, or it may become a higher order feedback in which the past experience of the entity is used, not only to regulate specific movements, but also whole-order of behavior. Such a whole-order feedback can be what is commonly known as a conditioned reflex in the human body.[29] In automatic control systems this conditioned reflex controls the system by programing into the computer the results of past performance which then becomes a reference for future performance.

The significance of feedback and the whole cybernetic system of automatic control may be aptly illustrated in the process of cold rolling steel. For many years, time, money, and steel were wasted because engineers could not adequately solve the problem of controlling quality in the cold rolling process. This was due to the many different facets of the

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[28] Guilbaud, p. 25.

[29] Weiner, p. 24.

steel making process that had to be taken into consideration in the rolling process. Malleability, ductibility, shaping, and temperature reduction were some of the many individual factors that had to be considered if the desired quality of steel were to be attained. This problem meant the consumation of many man hours, both on the production end and the quality control end.[30] However, with the advent of the cybernetic system, there is no concern about specific problems in quality control. All of the problems likely to be encountered in each area of control in the steel making process are pre-programed into the computer. Regulating devices phased into computer systems are not concerned with causes. They are concerned only with effects. Thus, any defect in the rolling mill's processing system is relayed to the computer which makes a correction of the deviation in milli-seconds. This complicated system of feedback in the steel mill has stemmed entirely from the flying ball governor of James Watt's steam engine. Far from merely fomenting the industrial revolution, this device has become the master spring from which all the waters of cybernetic systems flow.[31]

Feedback, however, does not occur in every type of system,

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[30] Ibid., p. 33.

[31] deLatil, p. 57.

but only in systems containing closed loops. If there is no return pathway for the signal of the effector, there is no way to complete the circuit. But if closed circuits--otherwise termed loops, meshes, or networks--are introduced, their presence means that reflex and reactive actions can be performed.[32] It may thus be stated that all goal-directed organizations, whether they be human or machine, demand some type of closed circuit.

There is one other part of the automatic control system which must be included if the system is to relay accurate information back to its central control. This is the servo-system. The servo-system maintains the intelligence of the system within the special sense that a machine can be said to be intelligent. This special sense is the ability to make perfunctory decisions on its own without aid of human intervention. Being error-actuated, the servo-system reacts to external circumstances, but only in a fixed manner. To this extent, it is the information handling device of the automatic control system.[33] In actuality, it is the combined sensing devices of the system. Through the function of a very simple servo-mechanism, the voltage regulator or a gen-

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[32] Guilbaud, p. 17.

[33] Bell, p. 28.

erator, it becomes apparent that the servo-system is the mechanical slave of the automatic control system. Just as the voltage regulator constantly keeps the generator from producing too much or too little electricity, the servos in the automatic control systems continually keep the entire system running at peak performance.

The control and communication that occurs in the co-ordinated automatic control system with its reactor, the computer; its sensors, the servo-systems; and its effectors, the automatic machines which undertake the actual work; the function of the system seems to be the complete and perfect machine.

Yet, there is a fallibility inherent in any kind of communication machine that must be recognized. Indeed, the guidance counselor would do well to consider this last aspect of the technology of cybernetics with extreme care, especially if he employs cybernetic systems in future counseling. The problem inherent in all communication and control systems is entropy. That is, a measure of the amount of information that is available in a given message. If there were no entropy in a given message, then each symbol within the message could serve interchanbeably with any other symbol in the message to formulate infinite numbers of meaningful messages. However, this is an impossibility, for in any meaningless

state--such as the mixing of random letters of the alphabet, there will be so many sensible words constructed and a greate number of non-sense words. This is true of any entropic system which constantly strives for spontaneous decay in any message heading toward an ultimate state of meaningless uniformity. Therefore, if uniformity is the chief end of entropy, there can be no degrees of "probability" in propositions in a message. There can only be "yes"and "no" functions in high efficiency messages since "probable" functions are hardly uniform. This then is the principle of the binary digital computer. The binary symbols, zero and one, perform the "yes" and "no" branching functions in the computer. Suppose that it is desirable to find the twenty-third function in a thirty-two member system. In a normal distributive system there would be thirty-two choices. However, by performing binary branching, the entropic value of the system is established to five digits. To do this a binary digit system is established using the binary notations of zero and one at each branch of the thirty-two member field. A diagram will suffice to illustrate how the binary notation of 10111 stands for the specific function, twenty-three.[34] Therefore, by using long enough binary digital

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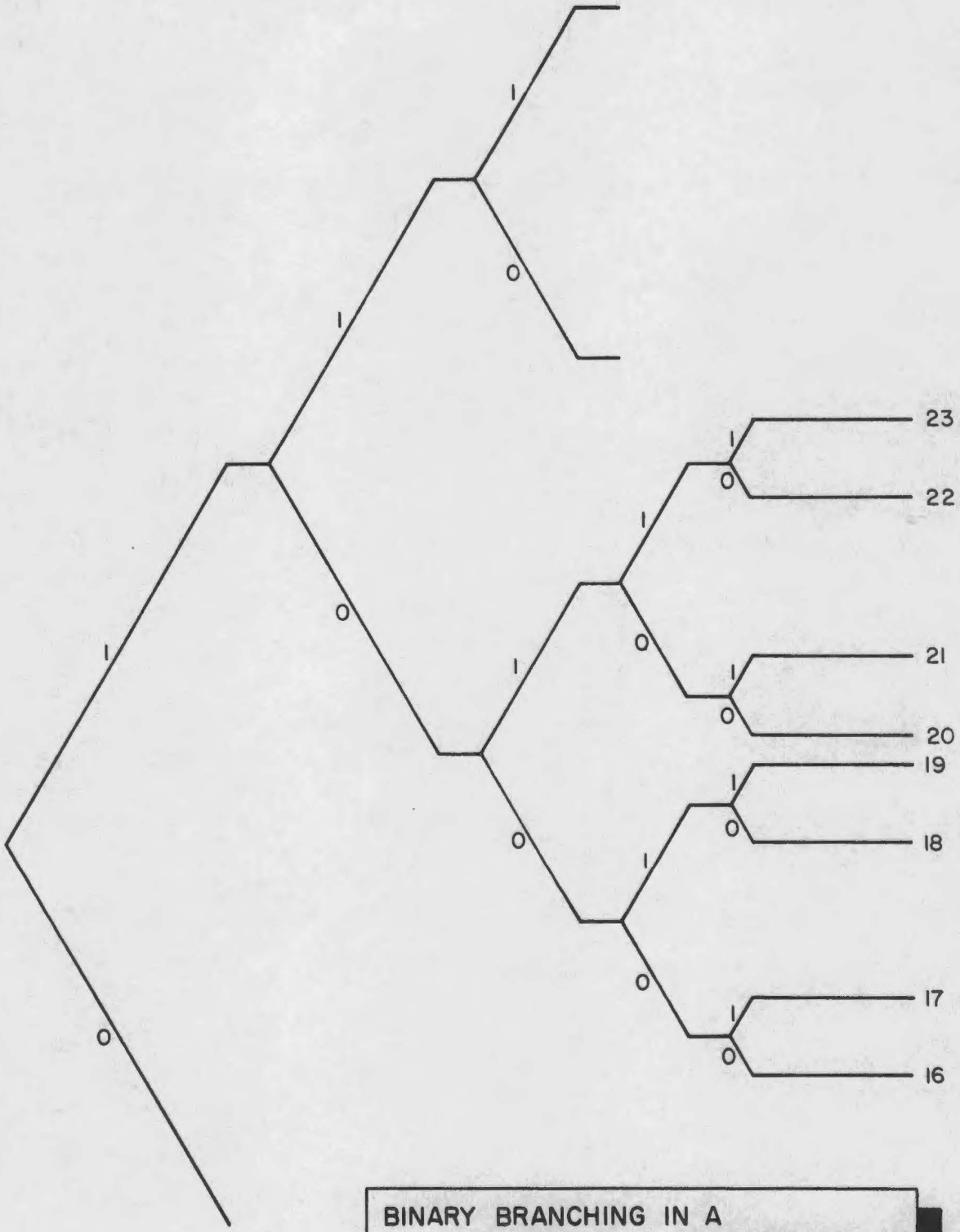
[34]George, p. 115.




BINARY BRANCHING IN A
THIRTY-TWO MEMBER FIELD

notation sequence, any specific entity within a given set of any size can be found. This may seem to be a rather difficult way of reaching the integer twenty-three to the layman. Yet, it must be remembered that because of entropy there is no other way for the computer to arrive at the correct answer. Also, once programed, the memory drum in a computer can recall vast quantities of information in milli-seconds. While computers can perform logical decisions, this logic is based on pure statistical definitions from which all human elements are excluded: moral imports, scientific significance, artistic quality, and business speculations.[35] Only when these topics can be quantified in other than degrees of "probability" can the cybernetic system perform value judgments.

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[35]Bell, p. 11.

## CHAPTER III

## CYBERNETICS IN INDUSTRY

The capacity of the country's industry is directly proportional to automatic control.[1] In recent years, the prospect of deteriorating sales, increases in foreign competition, and lower profit margins have led business management to turn first to automation and then fully automatic control systems as the most efficient means of reducing costs and increasing productivity.

There are five main banefits which may be maintained by conjoining cybernetics with business and industry. In the first place, in a competitive society, a successfully cybernated organization has economic advantages over a competitor who uses people instead of machines. Thus, it is no longer a question of switching to automatic control systems or not, but rather, how far to proceed and how fast to go.[2] In the second place, reducing the number of people in an organization reduces the magnitude of management's human relations problem--whether these be coping with union negotiations, featherbedding, human errors, or indifference.[3]

Third, cybernation permits much more rational use of time given over to managerial activities. Computers can produce

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[1]Eugene Ayres, "An Automatic Chemical Plant," Automatic Control, ed. Scientific American (New York: Simon and Schuster, 1955, p. 43.

[2]Donald N. Michael, A Report to the Center of Democratic Institutions, Cybernation: The Silent Conquest (Santa Barbara, California: The Fund for the Republic, Inc., 1962), pp. 12-13.

[3]Ibid.

information about what is happening now as well as continually updating information about what will be the probable consequence of specific decisions based on present and past circumstances. Freeing management from petty and sometimes costly decisions such as these permits precise and better substantiated managerial positions. The management can then have much better control over the system as it operates, and over the changes into future operation.[4]

Fourth, cybernation allows government and industry much greater freedom in locating their facilities efficiently in relationship to the accessibility of raw products, markets, transportation and needed human and natural resources.[5] Distances are no longer a real barrier, for computers can control sensors and effectors anywhere.

Fifth, cybernation is needed to maintain the basic nesessities of an ever growing population and to maintain or increase the gross national product.[6] If, then, the criteria is for communication, control, and profits, there are strong reasons why government and business would want and have to expand cybernation as fast as they can.

Upon these theories the future guidance counselor must

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[4] Ibid.

[5] Ibid.

determine the influence that cybernetics will have upon the society in which his counselees will seek their life vocations. At present, cybernetics has not greatly permeated industrial processes because of the tremendous cost the system entails. Furthermore, the delicate nature of the work needed in building cybernetic systems and the variability of the functions that the systems will have to perform, precludes the use of the methods of mass production.[6]

Yet, the guidance counselor should be aware that the time is fast approaching when automatic control systems will be mandatory throughout the American economy.[7] Specifically, cybernetic systems will have to be employed to offset the rising costs of labor. Also, many industries demand conditions in processing which call for such extreme conditions of speed, temperature, pressure and chemical exchange which make human control impossible.[8] It can be stated that there will probably be manufacturing processes that cannot and will not be cybernated. The only reason they will not cybernate sooner instead of later is convenience and economy.[9]

What will be the net result of the integration of cybernetic systems throughout the country? Industrial productivity will

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[6] Ibid., pp. 13-14.

[7] Weiner, p. 155.

[8] Ernest Nagel, "Self Regulation," Automatic Control, ed. Scientific American (New York: Simon and Schuster, 1965), p. 4.

[9] George, p. 259.

certainly increase. Many products are now of finer quality than they have been before and will continue to improve. Working hours have been reduced and will continue to decrease. Furthermore, much of the back-breaking drudgery of hard manual labor has been, and will continue to be, removed from society.[10] This forward progress must be maintained, not only to facilitate and ease the burdens of mankind, but also to perpetuate the economy, for the economy of a modern industrial nation is like a feedback mechanism. Each industry, each type of activity, consumes the products and services of other sectors of the economy, and at the same time supplies its own products and services to them.[11]

It must be remembered that cybernetic systems are not like the transfer line in a Detroit automobile factory which automatically transfers car assemblies from one machine to the next and positions the assembly for the next operation where the assemblies are joined together by human labor. The only automatic feature here is the conveyor system which brings such assemblies to the main assembly line at the required rate. Since this system does not use closed loops, automatic control, or information handling devices, the Detroit assembly line has little to do with the other automatic control systems to be examined in this chapter.

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[10] Nagel, p. 10,

[11] Wassily Leontief, "The Economic Impact," Automatic Control ed. Scientific American (New York: Simon and Schuster, 1955), pp. 73-74.

Where cybernetics is finding wide use is in continuous output factories such as canneries, steel rolling mills, wire and tin plate factories, paper mills, chemical plants, and oil refineries. Cybernetic systems are fast becoming indispensible in these factories because the rapid decisions that have to be made are far too dangerous for the slow reaction time of human operators. This is true to the extent that nothing in a fast moving factory line should be left to the excited judgment of someone on the spot. If a policy can be thought out in advance, it can be committed to a taping which will regulate the conduct to be followed in accordance with the readings of the sensors device.[12] The pen-ultimate in the cybernetic factory is shown in a schematic diagram on the following page.

A classic example of society's need for a high speed cybernetic system is the oil refining industry. If the more than fifty thousand control devices to be found in the typical cracking plant were suddenly to go on strike, the economy of the country would be faced with economic catastrophe.[13] If the control devices could be replaced by the old manually operated refineries, the country would then have to build four or five times as many cracking facilities, and also eliminate many

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[12] Ayres, p. 40.

[13] Ibid., p. 41.

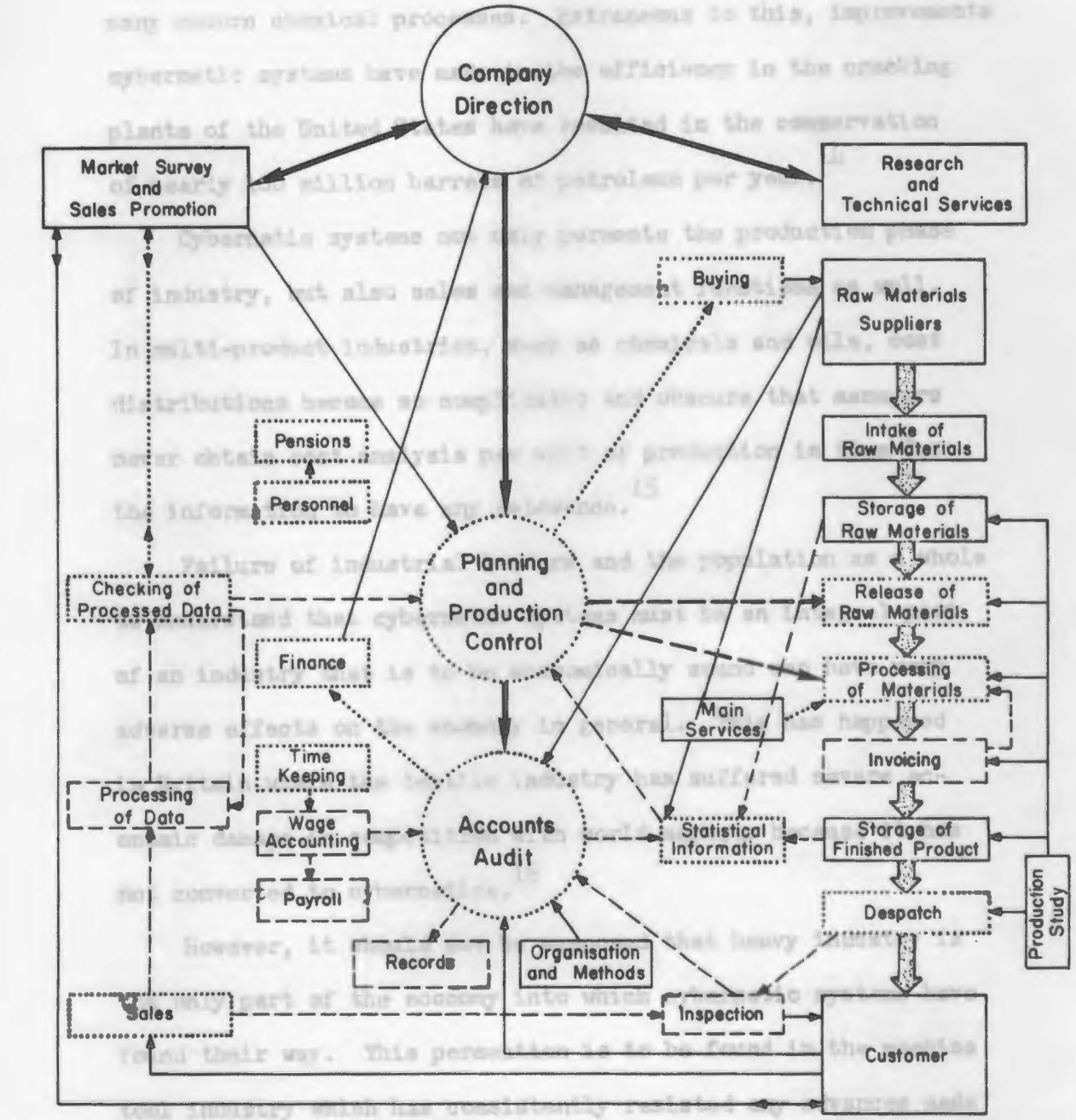


CHART of ELECTRONIC FACTORY CONTROL

many modern chemical processes. Extraneous to this, improvements cybernetic systems have made in the efficiency in the cracking plants of the United States have resulted in the conservation of nearly 100 million barrels of petroleum per year.[14]

Cybernetic systems not only permeate the production phase of industry, but also sales and management functions as well. In multi-product industries, such as chemicals and oils, cost distributions become so complicated and obscure that managers never obtain cost analysis per unit of production in time for the information to have any relevance.[15]

Failure of industrial leaders and the population as a whole to understand that cybernetic systems must be an integral part of an industry that is to be economically sound can have very adverse effects on the economy in general. This has happened in Britain where the textile industry has suffered severe economic damage in competition with world markets because it has not converted to cybernetics.[16]

However, it should not be supposed that heavy industry is the only part of the economy into which cybernetic systems have found their way. This permeation is to be found in the machine tool industry which has consistently resisted any advances made

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[14] Ibid.

[15] Lawrence P. Lessing, "The Automatic Office," Automatic Control, ed. Scientific American (New York: Simon and Shuster, 1955), p. 68.

[16] Ayres, p. 43.

by automation. Inroads have not been made by cybernetic systems on the industry because of the relative difficulty of programing a machine to handle a different set of instructions for each product. It must, therefore, be able to deal with more diverse information and communication problems than a one product industry such as a steel mill. Thus, the cost of the information handling capacity is spread over many items instead of a relative few.[17]

Yet, even this complex problem has been worked out and is now being applied at the Massachusetts Institute of Technology School of Experimental Design. The Massachusetts Institute of Technology system combines digital and analogue processes under feedback control to govern a milling machine whose cutting tool moves in three planes relative to the work piece. In this case, the model of the object to be fabricated is supplied to the machine in the form of a perforated tape, similar to that used in teletype systems. A ten foot tape will keep the machine busy for an hour.[18] The performance of this model illustrates that a fully automated machine tool industry is not only possible, but it is certain to be developed in practicality.

Cybernetics has not only found its way into both heavy and

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[17]William Pease, "An Automatic Machine Tool," Automatic Control, ed. Scientific American (New York: Simon and Schuster, 1955), pp. 55-56.

[18]Ibid., p. 57.

light industry, but also into clerical duties, as well. This is exemplified in the John Plain Wholesaling Company of Chicago which sells over 80,000 gift and houseware items through more than a thousand retail merchants. The business is seasonal and the company will sell anywhere from 2,000 to 15,000 items during the Christmas season. For optimal service, fast shipping and close inventory are needed. Since the work is seasonal, a low grade of workers are attracted. Thus, orders sometimes fall two weeks behind in the Christmas rush. The managers of the company decided that something had to be done. An automatic data processor along with its sensor and effector devices, called the Distributon, was purchased. Ten operators who run the machine were able to replace over fifty clerks in running the business. Not only does the machine fill orders, but it also takes a nightly inventory of all items in the store which would take approximately 150 clerks working an eight hour shift to accomplish. The rent on the total cybernetic system is $1,000 a month.[19] At the present, this is the exception rather than the rule in business establishments. Businessmen have been slow to realize the merit of these automatic control systems, and the result has been a cushioning of the big control

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[19] Ibid.

systems social and economic impact in this area. Eventually, machines of this type will take over the duties of thousands of clerical workers all across the country.[20]

Banking, the major economic institution of the country, is highly adaptable to becoming cybernated. Banks must keep permanent records of all transactions, must show on demand all operations performed on a depositors account, and gear their accounts on a depositor's check or account slip. Computors, coupled with magnetic tape, high speed printers, and closed circuit television will slowly but surely replace the teller. The only problem that has not yet been worked out is the ability of the cybernetic system to read signatures.[21] Almost all areas of business accounting, especially cost accounting, may be fed into and figured out by a computing machine. Once programed, other data may be fed into the machine from time to time, but the bulk of clerical work can be handled mechanically, leaving only extraordinary details such as outside correspondence to human beings.[22]

The new machines promise not merely clerical savings, but higher managerial efficiency as well. Because of the lag in compiling statistics, industry has been forced to mark time in

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[20] Ibid., p. 71.

[21] Ibid., p. 69.

[22] Weiner, p. 159.

crucial decisions while pertinent data was being slowly compiled. As more high speed computers are phased into business operations this time lag will pass from the scene. Managers will be able to react more swiftly to actual conditions. Inventories and production will lose their tendency to pile up disruptively. Managerial decisions will no longer be theoretical prognosis, but will be largely factual.

As a result of increased integration of cybernetic systems into business, managers have been unable to keep up with the rapid progress made in the field. Even now independent counseling services such as Arthur D. Little and Arthur Anderson accounting systems analysts have arisen to offer businessman help in the many varied mysteries and claims of the different automatic control systems.[23]

The foregoing are just a few cursory examples of the impact cybernetics is having and will continue to have on the economy. From the business standpoint, cybernetics promises to open whole new fields of thought, experimentation, efficiency, and profit. As the National Association of Manufacturers put it:

> Guided by electronics, powered by atomic energy, geared to the smooth effortless workings of automation, the magic carpet of our free economy heads for distant and

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[23]Lessing, p. 71.

> undreamed of horizons. Just going along for the ride will be the biggest thrill on earth. [24]

As utopian as this statement sounds, the many advantages of cybernetics will bring mixed blessings. While production will indeed use the cybernetic systems, these systems will create an inverse proportion by decreasing the number of personnel needed, while, at the same time production increases. Thus, cybernetics will beget a child whose name is unemployment, of which the ramifications threaten vast upheavals, changes and modifications within the context of contemporary society. With the guidance counselor now aware of the importance of cybernetics to the national welfare of industry, it may thus be argued that automatic control systems must continue to be one of the mainstays of the industrial colossus that has been shaped in America.

Therefore, in the next chapter of this paper, the reader should bear this in mind when the effects of a cybernocracy will be seen in its relation to mankind.

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[24] "Calling All Jobs," ed. National Association of Manufacturers (New York: n. p. 1955), p. 21. cited in Michael, p. 10.

# CHAPTER IV

## MANPOWER TRENDS IN THE AMERICAN ECONOMY

To be effective in vocational counseling it is vital that the guidance counselor be familiar with various manpower requirements in the future. This should be a two-fold endeavor on the counselor's part for a certain problem exists in the ability of statisticians to predict short term and long term manpower needs in the future. Thus, this chapter will consider both of these predictive areas, while, at the same time remembering that projection of future manpower requirements is both a difficult and hazardous task. Short term predictions will have some predictive validity and long term predictions will be highly theoretical in nature. It must also be remembered that manpower trends are affected by a great variety of possible events. New scientific discoveries and inventions, natural and man-made catastrophes, and the vagaries of consumer preferences all must be taken into consideration in projecting manpower trends.[1] The current war in Viet Nam is a classic example of the problems facing statisticians in predicting employment by industry.

There is now, and will be, a definite need for more insight on the part of counselors in helping people to find

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[1]Howard Stambler, "Manpower Needs by Industry to 1975," U. S. Bureau of Labor Statistics, Monthly Labor Review, LXXXIII (March, 1965), 279.

the right jobs that have a small turnover, as may be seen from Secretary Wirtz's statement that over 900 million days of potential production were lost in 1962 due to technological displacement.[2] Not only will the counselor of vocations have to concern himself with those who are already out of work, but also the increase in potential workers brought about by an increase in population which will push America over the 240 million mark by 1975 with 85 per cent of the increase occuring in the urban areas.[3] The sociological problems that will come about because of this resulting increase in manpower and decrease in jobs which call for little technical knowledge will be gargantuan and will be considered later on in the chapter.

The primary problem that will face the vocational counselor of the future will be an inverse proportion that will be created as the country moves toward complete cybernation. That is, as automatic control increases and the resultant goods and services that it can produce rises along with it, manpower needed to run the economy will fall lower and lower. This will not be so apparent in the next ten years as it will be in the distant future, because automatic control is still in its infancy. Nevertheless, it will start and the guidance

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[2] Secretary of Labor, W. Williard Wirtz, "The Challenge of Automation," An Address Before the Sidney Hillman Foundation (Rochester, New York: April 3, 1963), p. 19.

[3] Jack T. Conway, "Labor Looks at Automation and Civil Rights," Seminar on Manpower Policy and Program for the U. S. Department of Labor-Manpower Administration (Washington: February, 1965), p. 4.

counselor should be attuned to the immediate problems that will arise with it as well as those running into the projected future. One of many misconceptions about automatic control that the counselor is going to have to combat is the fallacy within the population that there is no need to worry about the evolution of society from the industrial revolution to the cybernetic revolution because the creation of each new machine will create as many new jobs as the ones that are outmoded and disposed of. This has long stood as a simple and logical argument based upon the supposedly irrefutable history of the past.[4] However, that was the past. As has been examined in previous chapters; concepts, ramifications, and manifestations involving cybernation are totally opposed to those of automation. The counselor should be well aware that innovations in cybernetics will not necessarily create jobs for those they eliminate. Cybernetic systems will be able to produce goods and services as cheaply and they will be superior in quality to those which are now man made. The machines themselves will be able to make, repair, and replace all working parts. There will be no major repair jobs to be done on the computers themselves since a computer will be

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[4]Wirtz, p. 9.

able to pinpoint trouble spots and breakdowns. Thus a maintenance man will be able to replace old worn out circuits with new ones. The building of these machines requires people of such superior intelligence and craftsmanship that there will be very few in the vast scope of the American society who will derive a living from computer manufacture. The time is not too far away when cybernetic systems will become so involved that only other cybernetic systems will be able to construct, repair, and replace them. Truly the capabilities of these machines are practically unlimited, and at one and the same time, the guidance counselor should realize that they hold the key to the freedom or enslavement of mankind because of their ability to replace manpower. This is not a new thought, for John Stuart Mill's brilliant mind looked into the future and saw the possibility that machines might evolve to such a high degree that, while machinery in most cases would benefit labor, this would not necessarily always be the result.[5]

A composite of manpower statistics for different industries for the years 1957 and 1964 should show the counselor which industries have suffered manpower losses and which have not.[6] It should not be erroneously presumed that all manpower gains,

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[5] Leontief, p. 72.

[6] See Table and Following Pages, Bureau of Labor Statistics, Monthly Labor Review, LXXXI and LXXXVII.

losses, or shifts are due totally to cybernetics. Other factors such as new products, population shifts, leisure time, and longevity have been inherent in manpower trends and will continue to play various parts in the increase and decline in manpower trends. However, as has been previously seen, cybernetics is playing an increasing, if not major role, in the flow and flux of manpower and will undoubtedly continue to do so.

One of the major areas of the economy that has hired the unemployed by the cybernated industries has been the service[7] industry.[8] At the moment it is certainly the fastest growing part of the economy. It has grown from 5.1 million to 8.1 million between 1947 and 1964.[9] This has been an increase of 16.8 per cent. Three main factors are pertinent to this rise. The first is the increased longevity and birth rate within the American society. This has necessitated rapid expansion in medical and health facilities and personnel; for higher incomes, increased emphasis on public health, medical research, construction of additional medical, dental, and public health facilities will give rise to the demand of additional thousands of technicians, nurses, and doctors.[10]

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[7] Service industry here connotes those areas of the economy which produce useful labor without producing a commodity, such as railroads, telephones and vending.

[8] Stambler, 282.

[9] Ibid.

[10] Ibid.

EMPLOYMENT STATISTICS FOR YEARS OF 1957 AND 1964[a]

| Industry | Employment in 1957 | Employment in 1964 | Percentage Change |
|---|---|---|---|
| Coal Mining | 238.1 | 444.4 | -39.50 |
| Crude Petroleum | 346.7 | 288.6 | -16.20 |
| Contract Construction | 3,025.0 | 3,106.0 | +2.70 |
| Meat | 327.3 | 314.2 | -3.70 |
| Dairy | 102.6 | 287.3 | +182.00 |
| Bakery | 288.8 | 278.7 | -3.50 |
| Tobacco | 92.8 | 87.3 | -5.50 |
| Textile Products | 1,004.0 | 897.2 | -11.50 |
| Lumber and Wood Products | 685.9 | 596.5 | -12.90 |
| Paper and Allied Products | 865.8 | 951.9 | +11.00 |
| Chemicals | 833.5 | 977.3 | +4.9 |
| Petroleum Refining | 205.6 | 186.7 | -11.9 |
| Rubber and Plastics | 264.7 | 430.2 | 63.2 |

| Industry | 1957 | 1964 | Percentage Change |
|---|---|---|---|
| Machinery | 1,693.4 | 1,612.2 | -4.6 |
| Electrical Machinery | 1,225.0 | 1,549.1 | +12.64 |
| Motor Vehicles | 807.1 | 771.1 | -4.5 |
| Aircraft | 878.1 | 605.5 | -31.0 |
| Trucking | 820.2 | 949.1 | 15.20 |
| Railroad | 986.3 | 665.2 | -37.50 |
| Air Transportation | 143.1 | 212.2 | +67.50 |
| Banking | 615.6 | 761.4 | +12.38 |
| Insurance | 853.5 | 844.7 | +32.20 |
| Laundry Cleaning, Dying | 492.0 | 536.7 | +9.0 |
| Hotels, Lodging | 517.0 | 1,193.2 | +131.0 |
| Wholesale, Retail | 11,534.0 | 12,188.0 | +5.40 |

[a]In thousands.

[b]The year 1957 is used because it was a highly productive year and cybernetics had not become so integral to the economy. The year 1964 is used instead of 1965 or 1966 because war is not considered a period of normalacy. Thus, because of increased production for the war effort, labor statistics do not give a true picture of normal employment.

the counselor may feel fairly safe in directing counselees into occupations such as these, for cybernetics will create sociological problems that are not readily adaptable to any future cybernetic planning.

The second factor is the continued economic boom enjoyed by the American society. Business services are also expected to rise as new products, increased advertising, and creation of new international ties in marketing take place.[11] Even though such factors of the economy as banking, insurance, and real estate are highly adjustable to cybernetic systems, their present boom should carry into the near future and grow evenly with the influx of cybernetic systems.[12] This may be seen in the 12.4 per cent rise in manpower needs for banking and the 3.2 per cent rise in employment in the insurance industry for the years 1957-1964.

The third and probably most important factor in employment trends has been the great amount of leisure time enjoyed by the American people. This may be graphically illustrated by the amount of rise in hotel, motel, and lodging personnel. From 1957 to 1964 the tourism industry rose 130.5 per cent in this one area. Related industries that also derive their

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[11] Ibid., p. 283.

[12] Ibid.

livelihood from leisure time are so numerous as to defy catagorizing. Certainly ease of communication, money in the American pocket, and extended vacations have given the Americans the title "Kings of the Road." This is fine for the present and near future, but the increase of leisure time is going to become so great that the blessings and problems it will create will be about equal.

Moving from the service industry to that of an adjacent field, public utilities, employment trends within the various subsidiary fields of public utilities are expected to remain steady or decrease somewhat. This is variable in certain utilities such as electrical power where cybernetic systems have already taken over much of the operative and distributive functions supplying electrical needs. A specific example of this is the International Bell Telephone Company whose calls have increased over fifty per cent in the last ten years, while personnel has increased only ten per cent.[13]

In the distant future, manpower needs are likely to decrease in electrical power, gas, water, and sanitary services as their need for complexity and speed-of-light operation to handle heavy public demand will become too much for the slow

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[13] Michael, p. 15.

reactions of man to cope with. A specific example of this movement is the Northern Illinois Water Company's Champaign, Illinois, plant. This entire system delivers up to thirty million gallons of water in a twenty-four hour day and requires only three men each working an eight hour shift to get the job done.[14]

Of all the industries, mining and the railroads probably have suffered most from a high level of cybernation. Employment in mining fell by more than one-third between 1947 and 1964--from 955,000 to 636,000. Cybernation has been especially severe on the bituminous coal industry which had a net decrease of 39.5 per cent in manpower from 1957 to 1964. This has not been of the coal industry's own volition. Competition from gas, petroleum, and electricity have forced coal companies to make radical changes in mining methods. This includes fully automatic control mines where the coal is mined, refined, and transported through pipelines to distribution centers without ever having been touched by a human hand.[15]

Railroads have also suffered from increased competition from air freight haulers and the trucking industry. This necessitated radical innovations such as direct haul, specific

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[14]Letter from Mr. Ted Dyer, Head Engineer, Northern Illinois Water Company, Champaign, Illinois, March 26, 1966.

[15]Stambler, 284.

load trains controlled from marshalling point to destination by fully cybernetic systems. This increased modernization has reduced personnel on the railroad by 37.5 per cent since 1957. While railroads are not expected to suffer as heavily as in the past, employment prospects for the future are poor for this industry. It should be quite clear that although air transportation manpower has risen 67.5 per cent and trucking has risen 11.6 per cent these industries do not call for skills concomitant with those of displaced railwaymen. Thus, railroaders have had a hard time putting their skills to use in other areas.

In contrast, construction manpower requirements are expected to rise substantially between 1964 and 1975.[16] The expected rise will be substantially more than the one per cent rise from 1957 to 1964. This will be due to increased building of state-federal highway systems, state school systems and private industry. Contract construction is one of the largest employers of the non-professional middle class and has long been a mainstay in our society. However, there are new concepts afoot in the building trades which would entirely revise construction of big buildings. As construction concepts and practices stand today, there is increased need for the

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[16] Ibid., p. 285.

skilled craftsman and little use for cybernetic systems. However, with the increasing influx of cybernetics it is to be expected that certain revisions and redesign of large construction projects will take place. This has already started to happen to some extent with the introduction of pre-fabricated walls which require no human involvment besides placing and bolting into position. While construction in the next ten years will call for increased manpower, there are ominous indications from design boards in architectural offices which may mean a sharp reversal of this trend in the future. In a recent design exhibit at the University of Illinois new design concepts of fiberglass and steel houses were displayed which could be assembled and disassembled as easily as tinker toys. There were no metal pipes, no wiring, or furnace in these designs. Instead, roll up plastic pipe, printed circuits and solar energy served in their place.

Non-durable industries such as synthetic rubber and plastics are expected to rise considerably in the next ten years. This will be due in large part to the relative cheapness of producing these goods. There is also a convenience factor in that worn out goods are not repaired, but simply replaced. There has already been a rise in manpower needs in these industries of 61.7 per cent from 1957 to 1964. Even

though these industries are highly receptive to cybernation, constantly rising production is expected to attract more people to work in these areas.

In retailing and wholesaling, manpower requirements may increase by as much as one-fourth between 1964 and 1975.[17] A general rise in goods sold in all areas of retailing and wholesaling has necessitated hiring of more and more personnel to handle retail and wholesale trade. Retailing and wholesaling has given jobs to many workers displaced from other trades. An increase of over 500,000 employees in this area since 1957 shows this to be true. Yet, there is a lessening demand for personalized service.[18] If people do not demand it organizations will certainly not provide it. For example:

> The R. H. Macy Co. is trying out its first electronics salesgirl. This machine is smart enough to dispense thirty-six different items in ten separate styles and sizes. It accepts one and five dollar bills in addition to coins and returns the correct change, plus rejecting counterfeit currency.[19]

Manpower needs in government are expected to increase rapidly in the years ahead. Overall, government manpower requirements in 1975 may be one-half higher than the nearly 9.5 million workers employed in 1964.[20] In view of sociological

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[17] Ibid.

[18] Howard Coughlin, President, AFL-CIO Office Employees International Union, A Report to the Subcommittee on Automation and Energy Resources of the Joint Economic Committee, U. S. 86th Congress, Second Session, USGPO (Washington: 1960), 591.

[19] Ibid.

[20] Stambler, 585.

implications, many of these government positions may become sinecures for the jobless. This question will be examined later in the chapter, when governmental control over the cybernocracy is examined.

The rise and fall of manpower needs is not highly relevant when seen by itself. The cyclic effect of our economy is responsible for many of the ups and downs that employment trends experience. However, when manpower needs tend to decrease in an economy where goods and services are on a continual increase then there is reason to wonder about the effects of automatic control systems. This may be seen as true by a short review of the tables on pages five and six of this chapter. Thus, any optimism about employment opportunities for the counselees will probably have to be tempered to a great degree. The steel, chemical, and meat industries are all sterling examples of this--experiencing areas of "across the board" increases in production of 27 per cent, 20 per cent, 3 per cent; while manpower percentages have not increased along with these production rises, being 4.9 per cent, 9.4 per cent, and 3.9 per cent respectively.[21] These figures, along with the expected increase in numbers of young people coming

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[21]Michael, p. 14.

into the working world, are going to hold some very difficult sociological problems when they are coupled with industry's rapid movement toward cybernation.

The potpourri of statistics on manpower requirements for different industries may seem as difficult to deal with as a many headed Hydra. Where does the guidance counselor start and what real meaning do these statistics have for him? Essentially, these statistics are important to the counselor because it will be up to him to place young Americans now coming into the work force in a hopefully secure and suitable occupation. Just to keep the rate of unemployment near the four per cent level is going to be a mighty task for the economy in the light of technological advancements that have already displaced vast numbers of manpower. The guidance counselor may be even more aware of this if he understands that employment must rise 1.6 million a year in the 1960's just to maintain a four per cent unemployment rate. This is even more marked when the counselor realizes that the 1950's required a rate of 800,000 workers a year to meet this figure.

This may become even more meaningful to the counselor

when he understands that the rate of growth of private employment would thus have to average more than two per cent a year over the next ten year period as compared with an aaerage annual rate of growth of slightly less than 1.2 per cent in the last ten years.[23] It is also pertinent to the guidance counselor to realize that these statistics should be compared with the total job increase per year in the private sector of the economy which has climbed in the last five years at the rate of 175,000.[24] There is then a differential of 1,425,000 workers a year. Government employment is expected to increase twice as rapidly as private employment and by 1975 the number of workers on the payrolls of the federal, state, and local governments is expected to increase by one-half as compared with an expected increase of one-fourth for workers employed by private enterprise.[25] Yet, this will not begin to offset the large increase in the manpower pool.

The largest increase in the work force that will be competing for these jobs will be in the group which is under twenty-five and the group which is over forty-five years of age. While finding work for older people is certainly vital to the well being of the nation, the influx of new workers is bounding

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[23] Ibid.

[24] Wirtz, p. 10.

[25] Stambler, 282.

upward in almost geometric progressions. In the 1950's young people were seeking jobs at an average yearly rate of 835,000 as against 2,600,000 in the present decade. By the beginning of 1970, it is estimated that over 3,000,000 workers under twenty-five years of age will be seeking admittance to the work force.[26]

Past experience, especially in the last twenty years, has shown the labor force is fairly flexible. This is especially true under the stimulus to take new vocational training for new vocations or be unemployed.[27] Yet, the counselor should not look at this statement through rose-colored glasses, for in one month's time 400,000 people in the United States will be working in a different geographical area, and over 800,000 will be doing different jobs.[28] This high transient record should indicate to the counselor that job security is not quite what it should be. Why is this migration taking place? The main reason is that the liberation of technology from the human labor system is having far greater consequences than as a labor saving factor. Factories are not being revised to suit the cybernetic systems instituted in them. Rather, industry is moving and re-designing the plants to suit the

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[26]Michael, p. 22.

[27]Leontief, p. 77.

[28]Wirtz, p. 13.

cybernetic systems.[29] As mentioned in an earlier chapter, this has been the reason for the demise of the textile factories in New England. Through these foregoing facts, the guidance counselor must accept realistically the fact that today's machines are not creating as many jobs as they are replacing. The evidence of the present and the ramifications these statistics will have in the future are not only going to have great economic significance, but also even greater and more far reaching sociological significance for which the guidance counselor should be prepared to deal.

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[29]Gordon S. Brown and Donald P. Campbell, "Control Systems" Automatic Control, ed. Scientific American (New York: Simon and Schuster, 1955), p. 28.

## CHAPTER V
## CYBERNETICS
## ITS EFFECT UPON THE WORKER IN HIS ENVIRONMENT

### The Economic Aspects

The automatic control system can and will be the economic equivalent of slave labor if not closely supervised, for any labor which competes with slave labor must accept the economic manifestations that slave labor implies. If cybernetics is permitted to travel this path, there will be an unemployment situation in comparison with which the thirties will seem a pleasant joke.[1] If the counselor thinks this absurd in the booming economy of the contemporary world, he would then have to dismiss the direction in which the economy is slowly but surely moving. For big business must get bigger, or drop by the wayside. Industrial society has so permeated society that there is hardly one area within the economy where the small business man is or will be able to survive. Ominous as it may sound, big business is speeding down a road that Marx laid the paving stones for over a hundred years ago. As he said:

> The bourgeoisie cannot exist without constantly revolutionizing the instruments of production, and thereby the relations of production, and with them the whole relations of society. [2]

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[1] Weiner, p. 162.

[2] Karl Marx in Alvin Z. Rubenstein and Harold W. Thorman, The Challenge of Politics, (Englewood Cliffs, N. J. :Prentice Hall, 1961), p. 77.

That is, as more and more businesses are forced to cybernate, more and more men are laid off. As more men are put out of work, their ability to buy goods and services further decreases. As this decrease comes about, industries are forced to cut prices to conform to consumer purchasing power. Greater efficiency is the only way to do this. This necessitates buying more machinery and forcing more men out of employment. This vicious circle continues, according to Marx, until there remains but one huge factory which then falters and the world is plunged into economic chaos. Marx was wrong as far as automation was concerned because he could not see the advent of two very important happenings. In the first, the invention and employment of machines in industry meant that more workers had to be employed to build the machines. Therefore, instead of industry being slowly exterminated through a demand for higher and higher efficiency, industry started to expand both laterally and vertically in an attempt to build the automatic machines that it needed. At the same time, the birth of the modern day labor union gave workers powerful bargaining rights. Thus, instead of men being employed to build and operate machines at the mere subsistance level they had known for so long, collective bargaining through the union gave them strength

and a fair share of the profit from the goods and services they produced. This in turn promoted greater economic strength throughout the entire society and brought about greater economic well-being for all.

This rather cursory explanation of Marx's dialectics may seem redundant to anyone having a high school smattering of economic philosophy, but it is very important to understand why Marx's theory stands a good chance of fulfilling its doomsday promise for capitalism.

Machines which are introduced into cybernetic systems are quite unlike those employed into the economy of Marx's time. Most, if not all, of these machines will not require the creation of whole new industries to produce new implements for cybernetic systems. Thus, cybernetic systems will be forced to use other cybernetic systems to produce goods and services. It would not even be too hazardous to say that the machines of an automatic control system can be self-perpetuating, in that they are able to diagnose any malfunction in their system and either repair it themselves or ask an electronics engineer to plug a new printed circuit into their system to replace a worn out one. It may be seen then that as more and more of these machines are employed in industry, Marx's theory begins to hold truth,

for increased competition and efficiency within industries will not simply throw men out of work, it will do away with human labor almost entirely except for those few specialists who will be needed to oversee the machines and set them up in factories. Another event pertinent to this that will lay firm groundwork for Marx's philosophy is the demise of the labor union. For one of the main strengths of unions is their sheer force of numbers. As these men are slowly phased out of their jobs the decay of the unions will follow proportionately and will mean that workers will have less collective bargaining power and be more at the mercy of the good will of their employers.[3] Thus, the vocational counselor in the industrial setting may probably be assured that no industry can be operated in a highly efficient manner unless the workers are satisfied in their own minds that they are certain of their place and of their economic and human status in industrial progress of the near future.[4]

The counselor should also be aware that once embarked upon this adventure there is no turning back. Quite possibly internal controls could be applied in our own economy to limit the spread of cybernetics--even at the cost of efficiency of

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[3] George, p. 277.

[4] Chapter Six of this paper discusses at length ways in which workers may be assured of employment, tenure and seniority rights.

competition between industries in the United States. However, with the shortening of lines of communication and commerce, the United States cannot afford to pursue any sort of isolationist policy, especially in the realm of economics. International trade and competition practically demands that the United States become as efficient as possible in all economic endeavors even if this might mean the individual worker be lost in the shuffle. Why is this so? At this very moment the Russians are carrying cybernation out to the greatest extent. That they should incur the relatively great expense of doing this both in costs of money and manpower displacement is easily understood. First, in building a new plant that is fully cybernated, the capital cost of production is no greater, perhaps, than that of a plant requiring human manipulation in the control of machine tools. Second, cybernetics is even more beneficial when one considers that the loss of manpower incurred by the Russians in World War II means that there is probably a very low reservoir of skilled craftsmen in Russia.[5]

It is therefore problematic that the race to cybernate, which will probably take place between the United States and Russia in their economic warfare could prove to lead down the

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[5]Bell, p. 33.

road to oblivion much faster and easier than the nuclear arms race ever could. To be beaten economically by the Russians would be a strategic blow that would be catastrophic to America, for if it is to attain victory in the cold war, the means of out producing its competitors is probably one of its chief weapons. It is from this basis of reasoning that there are now gathering voices of economic theorists in this country who fear that in our undeclared war to out-produce the Russians there will arise a concentration of political power that will impose rigorous authoritarian controls for all social institutions in the interest of the smooth operation of industry and the economy.[6] Were this to happen, it would probably be the ruin of democratic freedom as it is known today. Whatever the future of automatic control, government regulation is sure to increase.[7]

However, this does not mean that the democratic institutions of today cannot be democratic in a cybernetic society. To say that democratic institutions are possible only in the present day context would be no more logical than to say that the Greek city states were the only possible democratic society. Therefore the counselor should realize that with the advent

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[6] Nagel, p. 9.

[7] Ibid.

of automatic control systems throughout society, democracy will survive only as long as human needs are tended to along with economic ones. Certainly, utopia would then be a society which would work most efficiently in economic terms and, at the same time, take care of human concerns and career problems which automatic control systems will create.[8]

In the last five years, certain programs have been instituted which are a start in the right direction. The Redevelopment Act of 1961, the Economic Opportunity Act of 1964, and various public works legislation on the federal, state and local level represent stirrings in the right direction.[9] This has been at the cost of much vitriolic castigation by certain recalcitrant elements within the society who decry these projects as "pork-barrels" for local government.

The guidance counselor should not disregard this hue and cry, for it is adament upon him as an expert in his profession to defend these programs. Although these programs do have faults, especially in their effort to alleviate unemployment without seriously trying to understand the circumstances that confront them, they are a step in the right direction.[10] Any guidance counselor who feels that these are a waste of the taxpayer's money should consider that the entire cost of the Youth Employment Act program for a whole year--with 65,000 children

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[8] Wirtz, p. 8.

[9] Conway, p. 5.

10 Ibid.

as the beneficiaries--is only the equivalent of what is spent by this country on defense every ten hours. Surely no one would argue that defense is not important, but it is also difficult to imagine that giving this many youngsters preliminary training to help to engender in them abilities which will enable them to become effective members in the future society is not also worthwhile.

Yet the guidance counselor cannot do this job alone. This, then, is where cybernetics can play an integral role--for one of its subsidiary tenets is the establishment of communication and control between heretofore dissident elements. The guidance counselor cannot function as economist, engineer, political scientist, and government official at one and the same time. Indeed, he is fortunate if he can keep fairly well informed on the various aspects in his own field. It is vital, then, that the counselor leave the secure confines of his office and begin to trade and integrate his own ideas with others in areas knowledgeable about the different facets of technological change and unemployment. The very continuance of the free society, as it is known today, depends upon bridging the present schism between the knowledge of a very few about what can be done with the newly harnessed forces of cybernetics and the ignorance of a great

many who will have to make the decisions on what should be done with these forces,[12] as they pertain to economic and sociological ramifications for the society.

The social consequences that these forces hold for mankind are so great that scientists are probably going to have to shed some of their neutrality, come out of their offices and laboratories, as they did at the birth of the Manhattan Project, and its child, the atomic bomb, and present to the American people the facts about the consequences of the technological and social changes that are going to be experienced.

## Leisure Time Aspects

One of the most innocuous problems to be dealt with will be the use of leisure time. One of the prime assets that automation brought with it was increased leisure time. In the same vein, cybernation should create leisure time multifold to anything previously known. Cybernation will, undoubtedly, mean shorter working hours. The work week has already dropped from 67.2 hours in 1870 to 42.5 hours in 1950. Projections indicate that by 1970 the work week will be 36.3 hours, by 1980 this should decrease to around thirty-two hours.[13] Taking time out for normal sleeping and eating, this is going to give

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[12] Ibid.

[13] Leontief, p. 78.

man fifty-nine hours a week for leisure time activities. It is going to be a real problem for him to make good use of it, for this leisure will not be spread so evenly or nicely over the population as it might be supposed. The "leisure" class of the future can be divided into four different,distinct parts:

1. The unemployed.
2. The low salaried employees working short hours.
3. The adequately paid to high salary groups working short hours.
4. Those with no more leisure than they have now.[14]

In the first class, the unemployed with low educational backgrounds, leisure has until recently, been a respite from the drudgery of work. The main objective in the life of the chronically unemployed has been to find work. Of late, it has been more profitable, and, in many cases the only recourse, for the unemployed to collect relief checks without ever having to think about work. If this continues in the even greater proportion it is expected to, then the counselor should be prepared for some of the greatest mass of counseling that he has ever faced, for there will be many psychological problems if man cannot effectively use the vast amounts of leisure time that he will probably have at his disposal.

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[14]Michael, p. 29.

Certainly the great amount of idle time presented to these masses can lead to the formulation of deviant organizations which would foment far more radical insurrections than even the Watts riots.

The second group, the blue collar workers along with service personnel, may also be displaced. What will these people do with their leisure time? Probably much the same as they do now, sit idly and vegetate while waiting for the next relief dole. For the better educated of this class, there will probably be systematic efforts at self-improvement. This will not be easy, because for many the shift in living style that accompanies unemployment will be agonizing. These cases will probably be difficult to counsel, for the counselor will have to re-enforce and reaffirm to the client that he is not just a meaningless statistic but a real individual.

A different type of leisure problem will exist for the counselor with low income groups working shorter hours. Since job and security are synonymous with this group it would thus be reasonable to assume that "moonlighting" will take place.[15] By taking another job, the threat of psychological insecurity and unemployment is removed. This will probably be true, even if these people have the money to use for free time recreational use.[16]

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[15] Ibid., p. 29-31

[16] Ibid., p. 30.

Potentially serious social problems will arise for this group if the four-day week is instituted. What the man will do around the house for three days out of the week if he has little money to spend on recreation, will almost certainly add very real difficulties to the already inadequate, ambitious, and frustrating personal relationships that typify much of middle class family life.[17] This is the group with which the counselor should be prepared to deal most extensively, for it is the lower middle class which makes up a large percentage of our society. If this group becomes disenchanted with their way of life and cannot see any sense or reason to try to elevate themselves in society, then the whole social stratification of the society will most likely be endangered.

The third group should present few problems to the counselor or to society as a whole. This is the group with an adequate income. Its members, for the most part, will be professional, semi-professional, or skilled workers who will contribute enough in their social role to command a good salary but who will not be so rare as to be needed for a forty-hour week. If these people are given the access to added leisure time activities, they are likely to make use of it to the fullest extent. This group should become the chief reppsitory

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[17] Ibid.

of creative and skilled talents which could be transmitted to the other groups.[18]

The fourth group consists of those who will probably have little more leisure time than they had in the past. Much of the tedious work they have had previously will be removed by cybernetic systems, but there will be such insignificant increase in their ranks that most of their time will be consumed in work.[19] They will probably be the group least affected psychologically by cybernetics since they will have no more leisure than they have in the present.

The main problem of all these groups lies with the second one, the low salary group. The counselor must ask himself how he can find the key to unlock interest patterns and open new approaches to a large segment of the population that is forced to work shorter hours, but is used to equating work and security with hard, honest labor. Boredom may impel these people to seek new releases for unburned energies, but boredom combined with other factors may also work for frustration, aggression, and all the social and political problems these qualities imply.[20]

At the least, new conditions for need conflicts are going to arise within the American society. American people

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[18] Ibid.

[19] Ibid. p. 31.

[20] Ibid.

are going to be given the need for creative activities by virtue of more leisure and by the same turn of the screw creative activities may be difficult to promote in a society which may be so statistically inclined that individual creativity may cease to hold appeal. It would be redundant to again state that the fight will be for the freedom of the individual both physically and psychologically. For, of a certitude, the world is bound to be threatened by Fascist systems--the very tendency towards standardization with the existence of powerful scientific tools makes at least this much obvious.[21]

The seeds of social unrest that cybernation sows fall first ofaall within the minority groups. The Negroes, Puerto Ricans, Mexicans, and other minority groups in the United States are going to find themselves in an ever worsening plight. In dock, factory, and mine operations, where these groups have found their steadiest employment, the movement to cybernation is eliminating jobs with the vengeance of the "Four Horsemen of the Apocolypse." If this trend continues, social insurrections like Watts riots are only a prelude to a full scale race riot, unless measures are taken in the future to give these minority groups opportunities for self-betterment.

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[21]George, p. 272.

That statistics bear this out is only too apparent. Unemployment for non-white workers in 1964 was thirteen per cent as compared with four per cent for whites. Unemployment for white teen-agers was thirteen percent as compared with twenty-one per cent for non-whites in the teen-age category.[22] It is thus small wonder that riots such as Watts have not been more wide-spread when approximately one-fifth of the population has nothing to look forward to but loitering. The present failure to develop and utilize the potentialities of certain groups--Negroes who have been denied equal educational opportunity, the handicapped person, the older worker who is willing to work beyond retirement age are vocational chickens coming home to roost for the guidance counselor and society as a whole.[23] These minority groups are going to have to be permitted both social and educational rights. For, in the future, the well-being of society will depend upon the brains of these minority groups, not the prejudices toward them.

## Educational Aspects

Yet, brains and making the best possible use of them is not confined to the minority groups. It is going to be a

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[22] Wirtz, p. 13.

[23] George G. Dawson, "The Economic Forecast: Its Implications for Education," The Journal of Educational Sociology, XXXVI (October, 1962), p. 68.

task of the counselor to impress on all would-be drop-outs from high school exactly what his opportunities are for achieving any degree of vocational success. It is true that from 1950, when only 505 out of every 1,000 who entered the 6th grade completed high school that his figure had risen to around 670 in 1964.[24] This should be small solace to the counselor, for he has abjectly failed in the 330 other cases of that 1,000 because there will be very, very few jobs for those without a high school education in the cybernocracy. Yet, it is not really enough that 1,000 out of 1,000 entering high school complete it, for the future will hild that there will be an abrupt and final cessation of the demand for the type of factory labor performing purely repetitive tasks.[25] In the long run, the drudgesome and uninteresting nature of this work may make for more cybernation of these functions and this may make for a more culturally free environment. In the near future though, educational aims are going to have to be lengthened and changed radically if suitable advancements are going to be made in cutting down unemployment due to displacement by machine and achieving future cultural ends.[26]

It should also be remembered that machines will play no

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[24] Wirtz, p. 14.

[25] Wiener, p. 159.

[26] For various methods of combatting unemployment in present and future, see Chapter Six.

favorites between the manual and white collar laborer. Thus, the possible fields into which the new industrial revolution is likely to penetrate are very extensive and should include all labor performing judgments at a low level. How high this will reach in the echelons of the business world is going to become painfully evident:

> Informational technology should allow fewer people to do more work. The more it can reduce the number of middle managers, the more top managers will be willing to try it . . . One can imagine major psychological problems arising from the depersonalization of relationships within management and the greater distance between people at different levels . . .In particular, we may have to reappraise our traditional notions about the worth of an individual as opposed to the organization, and about the upward mobility rights of young men on the move. This kind of inquiry may be painfully difficult but will be increasingly necessary. 27

The psychological, as well as the sociological aspect of such a change in managerial policy and attitudes of aspirants to the middle class are far reaching. Surely this threat will be deeply disturbing to all those of the lower classes who aspire to the higher income brackets and good life of the middle class, since those who already aspire to the middle class may have little to look forward to in its fight for class status. What incentive will there be for these people to obtain an education when an education may be no guarantee of job or class security?

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[27]Michael, pp. 18-19

One of the answers is not a cessation or minimizing of educational goals. To be sure, many changes in goals and even in the curriculum itself are in the making but projections indicate that the divergent trends in industry manpower requirements will necessitate the demand for workers with even higher levels of education and skill.[28] This movement would, no doubt, create even greater pressures upon employment opportunities for the unskilled. This would not be too compatible at present with a great majority of the populace, but the prices paid for progress seldom are. Even if cybernation could supply as many jobs as it will displace, they would be so different in kind from the ones which were there before that relocation and reskilling would have to be done so efficiently and expediently that it is doubtful that science's concern would stop at all the way stations that would be required to accomplish the task in the time and manner required. The recorded history of progress substantiates this to a great degree. For progress waits for no one, and if the species fails to adapt to the situation it is soon driven to extinction.

The employee of the distant future, with the good job, will probably be a cybernetician. He will be a systems engineer of the highest degree. He will not be trained as he is today by

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[28] Stambler, 379.

adding together the old specialties. His field will not call for a jack of all trades, but a master of a new trade which involves a synthesis of mathematics, physics, chemistry, measurements, communications, and electronics, servo-mechanisms, energy conversion, thermo-dynamics and computational techniques.[29] There is no reason to think, however, that there will be an increased need for scientists, and there is a definite distinction between the average scientist and the highly trained cybernetician. There is a belief that even now much of the creative research and development being done is routine work being done by mediocre scientists and engineers. This leaves the supposition that there will be a few master generals of cybernetics who will be able to fight the war of knowledge without the affluence of many intellectual foot soldiers.[30]

In viewing the integration of cybernation into the future of American society in as hard and cold a perspective as possible; all things being equal, most white and blue collar jobs which can be done by computers will be. Schools, as they are now, will, for the most part, turn out better educated people. But the advanced kinetics of a cybernocracy will be beyond them since, by that time, machines should be as logically sound as

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[29] Brown and Campbell, p. 38.

[30] Michael, p. 21.

people.[31] There will be a small, almost separate society of people in rapport with the advanced computers. Cyberneticians will have established a relationship with the machines that will not be shared by the common man. Those with the talant for the work will probably have to develop it from childhood. When the country has arrived at a true cybernocracy, directly or indirectly, a large portion of the people will be doing the endless public tasks that government will not allow to be cybered because of the unemployment that would result.[32]

If the new logic is to resolve the problems raised here, it will have to generate beliefs, behavior, and goals far different from those which have been held until now and which are driving society more and more relentlessly into a contradictory world run ever more intelligently and making humankind ever more versatile slaves.[33] That this will come to pass, no one can say positively. That it might, as many knowledgeable seers suggest, come to pass is a distinct possibility.

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[31] Ibid., pp. 44-46.

[32] Ibid.

[33] Ibid.

# CHAPTER VI

## METHODS OF ADJUSTMENT TO CYBERNATION AND TECHNOLOGICAL CHANGES

The main responsibility of the counselor in the present day vocational counseling situation is to deal almost totally with the student while he is in the high school environment. The counselor-counselee relationship ends--if it ever develops in the first place--as soon as the counselee finds himself a job which he believes will satisfy his vocational desires. In some instances, and certainly not in the majority, a follow-up study is effected after primary termination of the counseling relationship.

This is a serious shortcoming. The rapid advancement which cybernetics has made and will continue to make in industry will cause tremenduous problems in job displacement and unemployment. It is not enough that a counselor be fairly sure that there will be no great change in job functions in a specific vocation that a counselee selected. The counselor should be prepared for the worst. That is, that it would be entirely possible for the counselee to lose his job because of technological change. It is thus highly desirable that the vocational counselor investigate practices of local industries in manpower displacement. If this cannot be done, he should, at least determine what related industries have done in combatting manpower displacement on the national level.

It is important then, that the guidance counselor make himself aware of current practices that are being used in contemporary labor-management circles to mollify the effect of technological displacement. If the counselor feels that a certain company is highly susceptible to cybernetic conversion he should be aware if the company gives advance notice of shut-down or lay-off and so note on any information that prospective job applicants may read in considering that company for future employment. This will also be beneficial to the guidance counselor to adjust to the change of employment. This is especially important since relocation of employees takes considerable time, expense, and effort on the part of the employer, employee, and vocational counselor.

If complete lay-off can be avoided then the guidance counselor should be aware of the different types of methods used in keeping their employees in their original occupations. He should also note these devices, along with their merits and faults, on appropriate forms for easy reference by his counselee. One of the primary devices in vogue today is attrition. Attrition--letting the labor force be reduced by death, voluntary retirement, or voluntary quitting and not hiring any replacements--is the least complicated method of avoiding hardships to workers

who would otherwise be laid off as a result of technological changes. A specific example of this has been the New York Transit Authority which has effectively reduced its work force by 7,500 men in five years.[1]

Closely related to attrition is early retirement. This concept provides for the retention of younger workers by inducing older employees to retire at an earlier age than usual. The most common arrangement under this plan permits the employee to retire at fifty-five or sixty years of age, if the employee has ten or fifteen years of service. In some cases, retirement is permitted at any age provided the employee has twenty years of service. Approximately three of every four private retirement plans contain provisions for early retirement.[2] The main problem that the counselor should note in listing this employment leveling device is that many times pensions are not high enough on voluntary retirements. Thus, the retiree is forced to look for another job which is oftentimes very hard or even impossible to obtain.

When an industry switches to a cybernetic system, jobs are not automatically cancelled out of existence. Many new jobs arise, but these jobs are so different as to require

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[1] Jack Frye, "Attrition in Job Elimination," Labor Law Journal, XIV (September, 1963), 809.

[2] U. S. Department of Labor, Bureau of Labor Statistics, Pensions Plans Under Collective Bargaining BLS Bulletin 1259 (Washington: U. S. Government Printing Office, 1958), p. 12.

vast amounts of retraining. In many cases, the intellectual task of retraining the worker requires far more formal education than the worker has. Yet, in a statement by the Director of Personnel Administration at Inland Steel, it may be seen that this is one of the better ways of keeping manpower attuned to technological change:

> . . . retraining the individual makes maximum use of manpower and contributes to the long range security of the individual . . . We think this is smart because it minimizes resistance to change, enables us to get up production faster than when people fear they won't keep their jobs, and gives us a quicker return on our investment. [3]

Job transfer is another semi-solution to employment displacement. When employees are transferred within the same plant, there are few problems. The guidance counselor should note carefully that if transfer takes place whether it is inter-departmental or inter-factory. Many problems can emerge if a worker is forced to change locale. Domestic problems entailed in moving a family, anxiety concerning a new job situation, and advancement and security in the job are all problems that should be noted in any kind of relocation program.[4] There are now in

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[3] Quoted in Wall Street Journal, August 23, 1961, p. 6, cited by Derek Bok and Max D. Kosseris in Methods of Adjusting to Automation and Technological Change: For the President's Committee on Labor Management Policy (Washington: U. S. Government Printing Office, n. d.), p. 9.

[4] Only 36 of 953 displaced workers elected to move when Ford shifted its Highland Park truck operation to Louisville. Only 35 out of 429 workers elected to move from Ford's Lincoln Plant in River Rouge to Lima, Ohio. See: Weber, The Inter-Plant Transfer of Displaced Employees. Unpublished report prepared for the Armour Automation Fund Committee, 1961, the Appendix.

effect a few collective bargaining agreements which compensate for paying the cost of relocation.[5]

Another of the major work-spreading devices employed in industry is the limitation of hours. The counselor should not be deluded by the company that maintains that it curtails unemployment and even c reates new jobs through a shorter work week. The theory is that if the overtime pay requirement is steep enough, the employer will prefer to hire additional workers rather than pay premium rates.[6] However, in a large majority of cases, penalty rates are merely paid to employees because of the amount of trouble in hiring other qualified personnel.[7] While this provides added remuneration to workers already involved in the industry, it does not help combat technological unemployment. Yet union leaders are in favor of shorter hours as a momentary stop-gap method of combatting unemployment. Reuben G. Soderstrom, President of the Illinois State Federation of Labor states:

> The hours of labor must be reduced so that those released from steady jobs by improved methods and improved machinery will have employment. Today through collective bargaining the change to shorter

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5 A BNA study in 1960 reported that only 3% of a representative sample of collective bargaining contracts signed contain provisions relating to relocation and moving expenses. Research indicates this figure has risen in six years since this study. "Basic Patterns in Union Contracts" (5th ed., Bureau of National Affairs, 1961), pp. 93-10a.

6 Clyde E. Dankert, "Shorter Hours in Theory and Practice," Industrial and Labor Relations Review, XV (April, 1962), 319.

7 Report on Testimony of Secretary of Labor Wirtz, Daily Labor Report, no. 33 (February 17, 1964), p. AA-4.

> hours is controled and jobs are found for those victimized by automation in unionized plants . . . In my judgment the shorter day, 7 and 6 hours wbthout a reduction in pay, is the best solution to automation. [8]

Relevant to this, the counselor should also make sure that if layoffs within the company occur, there is some method for easing the burden of unemployment. The most common method is, of course, severance pay, which provides a lump sum for workers who have been permanently laid off. The concept of severance pay is fairly common, being included in over thirty per cent of all agreements made between union and management in 1963.[9] The counselor should be cognizant of the fact that benefits ranged from one day to three weeks per year of service in the agreements reached in 1963.

Co-ordinate with severance pay are the (SUB) Supplemental Unemployment Benefits and (TAP) Technological Adjustment Pay programs. These programs pay benefits to workers who are displaced out of funds financed by employers. There are two problems with which the counselor should be concerned when dealing with these programs. First of all, duration of most benefits are

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[8] Quoted in a letter from Reuben G. Soderstrom, President of the Illinois State Federation of Labor, April 5, 1966.

[9] U. S. Bureau of Labor Statistics, Division of Industrial and Labor Relations cited in Methods of Adjusting to Automation and Change P. 18.

While aspects pertinent to retraining have been discussed previously, the guidance counselor should be aware that any retraining program may encounter obstacles other than the trainee's intelligence and educational background. Therefore, these points should be taken into consideration by the counselor whenever any company mentions retraining programs:

1. Availability of jobs.
2. Sufficient training time to complete the program.
3. A central clearance center in a given labor market with a reasonably complete inventory of current job vacancies and an ability to interpret employers skill requirements in the foreseeable future.
4. Adequate placement and training facilities in either plant or community.
5. Sufficient education, aptitude and incentive on the part of the displaced worker to permit effective training. [13]

Unions also operate training centers to keep up with technological advances in certain crafts. While unions operate under the stigma of being highly selective and operating on a tightly structured system as far as admittance and employment is concerned, the counselor should, nevertheless, be aware that through apprenticeship and union financed retraining programs the unions are, in many instances, very effective in keeping up with technological change. One of the best examples of this

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[13] Bok and Kossoris, pp. 25-26.

has been the establishment of the West Coast Longshoresmen Mechanization and Modernization Fund which came into being in 1960 when a six-year agreement was reached between the longshoresmen's union and the Pacific Maritime Association. The agreement enabled the companies to eliminate restrictive work rules in exchange for a substantial benefit package of over five million dollars a year for five and one-half years. It further guaranteed that there could be no lay-offs stemming from automatic control systems for regular longshoresmen. Even if other facets of maritime business became cybernated, the longshoresmen would still receive pay for a minimum 35 hour week.[14] This agreement stands as one of the more sensible agreements arrived at by both union and management, for it not only gives ample time for retraining a vast majority of laborers, but also permits them to slowly be paroled out to other industries instead of in a flood of manpower.

Integral to this, it should also be the responsibility of the counselor, as a responsible member of his profession, to help to see that improved training and retraining programs are instituted and perpetuated in this community. A start has been made with the inception of the Manpower Development and

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[14]Roby B. Helfgott, "Easing the Impact of Technological Change on Employees; A conspectus of United States Experience," International Labour Review XCI (January-June, 1965) 13-14.

Training Act, the Youth and Job Corps and expanded federal aid to vocational education for those still in school.[15] Yet the plowshare put to work here has made only a few furrows in the wide field of job training.

Retraining has been made difficult for four main reasons:

1. Many employees lack the basic qualifications for such training.
2. Seniority considerations sometimes obstruct the best selection of employees for training in particular.
3. Elder workers are generally slower to learn and require more intensive and prolonged training than young workers or new entrants into the labor force.
4. Employees and their unions are often unenthusiastic about the programs companies devise for upgrading the work force.[16]

Thus, the vocational counselor should not only be cognizant of advances and setbacks being made, but he should also become aware of the possible programs that would apply to his specific district and how to obtain the funds, equipment, and personnel necessary for these programs. It should be made clear that this paper does not propose that the guidance worker assume responsibilities extraneous to those of the school and the vocational counselees under his guidance. Yet, it is possible that the counselor might become more attuned to conditions affecting employment conditions extending beyond the milieu of the high school.

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[15] Ibid., p. 520.

[16] Ibid. p. 508.

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