Foreword to "Behavior Technology and Social Change"

This paper is an abbreviated version of a 1966 address I delivered at a conference of the American Management Association. My original intent was to proceed with the development of the listed industries in partnership with Xerox Corporation, which had recently bought my company Basic Systems, Inc.

But of the ten industries I described, the only new one Xerox wanted to enter was early childhood education. They funded it generously from 1966 to 1968, but then decided to confine their further investments to Industry (c), in which they achieved a historic success with Professional Selling Skills (PSS). They sold the PSS business for $117 million in 1985. For details, see the download "Behavior Technology and Education Reform" in the present website.

Forced to proceed on my own, I formed UEC, Inc. and used the paper to help raise $11 million of capital for it during the 1968-69 time period. UEC was active in Industries (a) and (d) (early childhood development), and Industry (e)—a new type of K-12 school (For descriptions of this work, see the download "Behavior Technology and Education Reform" in the present website.

Industries (b) and (i) were undertaken by a company I formed in 1966 with the engineer Eugene Leonard. As major banks inevitably began to dominate the "electronic cash and credit" industry, we were left behind as the visionaries.

Our Industry (b) project was funded generously by the Brazilian government's *Instituto de Pesquisas Tecnologicas* from 1975 to 1978, with Leonard and me supervising it. Subsequently, many of the STACKS functionalities were superseded by Wikipedia and the Internet.

For Industry (f), patient education, I formed Media Medica, Inc., described on this website under Mechner enterprises. Other behavioral technologists and the Cambridge Center for Behavioral Studies achieved great successes in Industry (g).

-Francis Mechner, 2014

BEHAVIOR TECHNOLOGY AND SOCIAL CHANGE

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INTRODUCTION

My point of view is that of a social scientist who has become convinced that in our society, industry is the principal force for social and cultural change. Today, it is the vehicle for the emergence of a group of industries whose seedbed is behavioral science. This group of industries will wreak changes more profound than those of the industrial revolution.

Long ago, society began to fund physics, chemistry, and biology quite generously when it saw that they deliver benefits. Behavioral science has had a late start, and is only just beginning to deliver benefits. But nowadays, society is much more attentive to its scientific benefactors than it used to be. A dozen large corporations have recently made serious commitments to the behavior-based industries, and federal agencies are spending funds for education and the behavioral science on an unprecedented scale.

THE BEHAVIOR-BASED INDUSTRIES

A number of separate industries are beginning to emerge. In some there is already considerable commercial activity, while others are still in the technological research and development stage. Here is a partial list of some of the behavior-based industries that are already discernible:

a. Pre-school education
b. Systems for the storage, transfer, acquisition, and consolidation of knowledge
c. Industrial training
d. Basic literacy
e. School systems designed around behaviorally defined educational objectives and individualized instruction.
f. Medical and health education
g. Behavioral design of work environments
h. Applications of computer systems technology to community affairs, including continuous referendum systems
i. Electronic cash and credit, sometimes called the checkless society
j. Community design and development

An industry must be defined by a market, that is, a set of purchasing units that have a type of need in common, and a class of products that are related in some functional way.

THE CONCEPT OF AN EDUCATION INDUSTRY

One hundred and fifty years ago, one might have spoken of a physics industry emerging, as physics was generating applications in one area after another. But today we know that there never was nor could there ever be a physics industry. What emerged was an electric power industry, a telephone industry, an automobile industry, an aviation industry, an electronics industry, and a computer industry. But no physics industry, even though these industries are

all based on physics. It will be the same with behavioral science. There will be many different industries all based on behavioral science, but no behavior industry or education industry. Neither has the attributes of an industry.
The ten industries listed above are today in various stages of development. A few are already developing and others have not yet been born. But each has the characteristics of a major industry. Each corresponds to an important and recognized human need, and has a corresponding set of distinct identifiable purchasing units and class of products.

Social, cultural, and attitudinal changes occur in response to the appearance of technologies and the marketing of products that fill existing needs and solve existing problems.

Pre-school education will become a widespread institution when corporations with the needed marketing resources will bring effective and economical pre-school educational materials into the home or into pre-schools. In schools, individualized instruction oriented toward behaviorally-defined educational objectives will replace today's residency and lockstep-oriented schools when effective materials and administrative systems are made available to the schools through appropriate marketing efforts. Computerized knowledge acquisition and dissemination systems will come into widespread use when economical reliable, and effective systems that meet the needs of both the

disseminators and the consumers of knowledge are made available.

In short, it is up to industry and behavior technology to bring about the social and cultural changes.

Discussion regarding the role of textbooks, teaching aids, programmed instruction, and other instructional media focus on the medium rather than the ultimate benefit to society. Behavior technology is outcome oriented, not media oriented. Its product is always behavior or behavior change, regardless of medium. Here, the end determines the means. Market analysis in the education field, as in any field, must begin with the target population or market, and an outcome that would be rewarding or desirable to that market and target population. Only then can behavior technology go to work and produce a new, better, cheaper, more enjoyable, or more effective way to enable that target population to achieve that desired end. It is futile to try to find a market for existing methods, devices, or techniques.

DISCUSSION OF THE MAJOR BEHAVIOR-BASED INDUSTRIES

a. Preschool education

When it comes to the accumulation of concepts and skills, the rich get richer faster. That is why investment in a child's pre-school education yields the largest return on educational investment, a fact that has long been recognized by psychologists. It is now also coming to be recognized by

educators, social planners, government agencies concerned with education, and the general public, as evidenced by the recent large increases in federal funds for pre-school education, the surge of articles and books on the subject, and the increasing rate of entry into the pre-school market by major industrial corporations.

The machinery of the adult intellect is built up of many thousands of concepts and skills. The acquisition of these begins in early infancy. The infant or child is constantly seeking learning experiences. Effective toys provide such learning experiences. The faster the child acquires concepts and skills, the faster he progresses with the biologically vital task of building his intellectual machinery. It is likely that most of the individual differences we see between adults in intelligence, aptitudes, and creativity are due in large part to variations in the rate at which they encountered the relevant learning experiences during their early years. As Charles E. Silverman stated in his August 1966 Fortune magazine article, the modern concept is that intelligence is learned, not innate.

Behavioral psychologists concerned with child development know a good deal about ways to enhance early intellectual development in children. Many simple and practical devices and systems have already been developed, and more will be developed in the next few years. In the future, traits such as adaptability, inquisitiveness, and creativity will become increasingly important as social, cultural, and

technological change accelerates. These traits can be developed only during the early years of life.

Those are the reasons why pre-school education is today one of the major challenges facing behavior technology and industry.

b. Systems for the storage, transfer, acquisition, and consolidation of knowledge

Such systems, STACKS for short, identify and address the principal problems of the current information explosion.

The most serious problem is not one of keeping up with new knowledge or of storing and retrieving more documents. The real problem is to find and consolidate knowledge. Today, individuals seeking information must wade through increasing amounts of irrelevant material to find what they want. In several fields the point has already been reached where scientists depend less on the published literature than they used to, and more on personal contacts with colleagues. The result of this trend is a slowdown in the transmission and dissemination of knowledge in the face of an information explosion, with an increasing percentage of potentially valuable research being buried and forgotten under growing mountains of publications.

Advances in knowledge and new discoveries typically do not consist of new facts that are simply tacked on to the compendium of older facts. They usually involve a conceptual

restructuring within a field or across fields. When an individual keeps up with new developments he typically does not simply "add" to his knowledge; rather, he studies fields adjacent to his own as they become relevant, or he relearns his own field in the light of new insights.

This is the principal challenge to the builders of information storage and retrieval systems, a challenge which the Institute of Behavior Technology's STACKS project attempts to address. A brief description of this system may be useful as an illustration of the direction this industry may take.

The STACKS will provide individuals seeking instruction or information with access to a memory store to which thousands of scientists and scholar contribute. The contributors obtain a steady stream of feedback data from the inquirers as to the usefulness and quality of their contributions. This feedback enables the contributors to revise their contributions continuously. Contributors may be paid royalties in relation to the frequency with which their contributions are requested by inquirers. This would tend to reward quality rather than quantity. The STACKS also provides built-in mechanisms and incentives for cross-referencing, consolidating, integrating, and simplifying the knowledge which is stored in memory.

The economics of STACKS are such that access stations could eventually be located in libraries, offices, laboratories, and even homes. The feedback features of STACKS make it

self-organizing and self-adjusting to its markets. Each segment of the user population shapes the memory content to its own needs by providing appropriate feedback to the contributors. In this sense, market research is built in.

c. Industrial training

This was the first area in which behavior technology achieved major successes, and it is therefore the furthest advanced of all the behavior-based industries. The most important products and services in this category are sales training, the training of company technical personnel, and management development programs. Many of these are currently being marketed by the Xerox Education Division. In each of these categories, very significant further advances may be expected during the next few years.

d. Behavioral design of work environments

Behavior technology will also make significant contributions in areas of industry that do not involve training, including the behavioral design of work environments and incentive systems. Behavioral technologists have demonstrated the benefits that can be achieved in terms of increased morale and productivity when certain basic behavioral principles are applied to the design of work environments. Most of these involve what behavioral scientists call "stimulus control." This term refers not to lighting or wall colors, but rather to the behavioral contingencies. Signaling or cueing are familiar as examples of stimulus control for

pedestrians. Motivational devices and improvements of interpersonal relationships, too, can have major impact on the morale and productivity of people at work.

e. Schools designed around behaviorally defined educational objectives and individualized instruction

During the past few years, a number of demonstration projects have been conducted with the general conclusion that it is both possible and desirable to define achievement in terms of the attainment of behaviorally-defined learning outcomes, without the additional requirement of residency. A corollary of this conclusion is the need for individualized instruction, which means that different students can advance through a series of learning objectives at different rates. This general conclusion is now gradually gaining acceptance among progressive school administrators and teachers, and government education agencies.

Such acceptance will, however, remain slow in spreading, until a way is found to implement the concept in practice. The wherewithal for implementing this type of system can be divided into three parts: (1) behaviorally defined objectives for the school; (2) the administrative and information system for running such a school; and (3) a system for training the teachers and other personnel who would be involved.

The development of the science education sub-system also presents challenging problems. During the past years,

science education has gradually been drifting away from the traditional subject-matter-oriented approaches which stressed knowledge of "facts" and is being replaced by a conception of science as primarily a method and process. Scientists say that science is mainly what scientists do, and only secondarily the compendium of knowledge they have accumulated. The next question is therefore, "What is it that scientists do? How do they think and how do they approach problems?"

Once the question has been asked in that form, the behavioral approach to science education can unfold. The next set of steps involves the operational specification of behavioral objectives and the behavioral analysis of the concepts and skills involved.

Many of the past five years' projects in this area have charted paths that are now ready for more intensive market-oriented development. Some of these areas have stressed inquiry-oriented laboratory approaches to science teaching. Others have demonstrated the possibility of using programmed instruction courses to teach problem-solving techniques, logical analysis, and scientific thinking. New media, such as behaviorally-designed programmed films, have also been demonstrated with encouraging results.

f. Medical and health education

During the past four years, pharmaceutical companies, Basic Systems, Inc., and medical schools have demonstrated that

self-instructional methods can meet several great needs of the medical community. Among these is post-graduate medical education -- the practicing physician's need to keep up with new developments in medicine; and patient education -- the needs of patients to understand their condition and to manage themselves accordingly. This industry is particularly well defined in terms of the market, the nature of the need, the characteristics of effective and acceptable products, and the purchasing units.

g. Applications of computer technology to community affairs and continuous referendum systems

The STACKS concept described earlier also has applications in civic affairs and self-government. Today, the principal limitation on the ability of communities to govern themselves is the inability of most members to learn about the issues, to analyze them, and to vote on them in accordance with enlightened self-interest. There is as yet no practical way to give the voter access to all of the relevant information, and much less to allow him to learn to understand the various implications of this information when it is somewhat technical. Even if he did understand all of the relevant considerations, there would still be no practical way for him to juxtapose and weigh the arguments and counter arguments being advanced by the opposing factions in connection with any particular issue.

Recent advances in computer systems technology and behavior technology make it possible for push-button and screen-

display consoles to take the place of the town meeting and the debating forum as the arena in which issues affecting the common interest are aired. The protagonists on any given issue could enter their proposals and supporting arguments into the memory of the computer system. Within the memory, they can rebut the arguments of their adversaries, who could in turn rebut the rebuttals. If a proposal or argument relating to a particular proposal is at all technical or complex, then it would be in the interest of the proposal's advocate to include instructional material which would allow the prospective voter to learn to understand the problems involved. The memory of the system would then be a combination of a debating forum and a set of instructional materials. Remote consoles, situated throughout the community, would enable each voter to participate in public affairs at his preferred time, pace, and place. He votes when he feels ready and the votes are continuously compiled by the central computer.

A system of this type would have applications in various kinds of situations, including clubs, towns, school districts, organizations, unions, and someday even states. It would have application in any community that wishes to govern itself or maximize the number of issues on which the membership can vote. An example of a possible immediate application is the impoverished community wishing to participate in its own anti-poverty programs under the Economic Opportunity Act. One of the acknowledged problems anti-poverty programs have encountered is the difficulty of enlisting the participation of the poor because of apathy,

cynicism, incompetence, and ignorance. This is a situation where computerized referendum systems might be of use. Doubtless there are many others.

h. Electronic cash and credit: a checkless society.

The concept of credit is a behavioral one: It concerns the individual's expectations as to how others will behave. This concept also pertains to organizations and countries. The particular symbolization or embodiment of credit that a society uses is an arbitrary social convention. It can take the form of coins, checks, houses, cattle, bank accounts, stocks, reputations, or verbal statements.

Because its form is arbitrary, credit will eventually be manipulated electronically. Electronic impulses are faster, more reliable, and cheaper to transmit and store than any other possible representation of credit. An economic and social system based on electronic credit must be engineered by behavioral technologists and computer systems technologists. The associated information transmission and display systems, and the behavioral contingencies according to which credit is checked and granted, must be designed in accordance with the capabilities of the electronic credit system.

Among the foreseeable applications of electronic credit are the central clearing of retail and other transactions so that one party's account is debited and the other party's account is credited by a central computer, computerized

computation of credit according to agreed-upon criteria, instant checking of credit, and applications of technology like computerized accounting and bookkeeping services.

All of these areas require collaborative research and development efforts of behavior technology and computer systems technology.

i. Community design and development

The population explosion in conjunction with increasing urbanization requires the development of new communities at an accelerating rate. During the past ten years we have witnessed the mushrooming of suburban communities, and corporations have gone into the business of building entire towns from scratch. We can anticipate the acceleration of this trend for the next several decades.

Sociologists have observed that many of the new communities are defective from the social standpoint, in that they are characterized by "social anomie," Merton's term for cultural non-belongingness or lack of identification with any particular set of deeply rooted social norms and all the symptom of anomie including juvenile delinquency, anti-intellectualism, and cultural impoverishment. It has been shown that such communities do not participate adequately in the intellectual life of the country and provide a breeding ground for right-wing political sentiment.

The basic reason for social anomie in these new communities is that they are conceived and designed as physical plants, as real estate developments and architectural exercises, rather than as communities. The physical plant of a community (its houses, streets, stores, parks, layouts, and transportation facilities) must consider the social system and some of the behavioral contingencies according to which members of the community make contact with their physical environment and with each other.

The areas of behavior technology that are relevant to the design of communities include several of the areas discussed above. There are also others. The commercial development of this industry faces serious problems, but not as serious as those that will face our society if undesigned or poorly designed communities continue to proliferate at the present rate. As billions upon billions of new human beings spread over the deserts, jungles, and oceans of our planet, in millions of new communities over the next fifty years, at rates that preclude the orderly incorporation of social cultures and traditions, the contributions that behavior technology will make during the next five to ten years in the community development area will shape the physiognomy of civilization.

THE ROLE OF THE FEDERAL GOVERNMENT

In areas that are socially important and where the benefits to the members of society are delayed rather than immediate, as in public health, housing, highway construction,

conservation, or anti-poverty programs, the federal government must provide the required funding. Several of the industries discussed earlier are examples of where the benefits to individuals, though great, are too delayed to motivate individual spending on a scale sufficient to keep an industry going. By this criterion the automobile, entertainment, and food industries do not require federal support; about half of the industries listed page one do. Federal state support of the public school system is an important example, but a new model will have to evolve for each of the areas in question.

Federal funding is important to the emerging behavior-based industries in providing funds to develop the products and services to be offered by the industry, and in supporting demonstration projects to test and evaluate the industry's products and services under controlled conditions.

THE NEED FOR BEHAVIOR TECHNOLOGISTS

The support that society provides to a science depends on the benefits it receives from that science in return. The dramatic acceleration in physics, chemistry, and biology research were made possible as a consequence of the technological successes these sciences generated. We are now witnessing the beginnings of the same situation in behavioral science.

Funds are being made available even more rapidly than they can be utilized because of the current shortage of

technological manpower. Society tends to bias funding toward the applied end of the research spectrum, a special case of a fundamental behavioral principle: The more immediate the payoff, the more one is willing to pay. The supply of technical manpower in behavioral science, however, is still biased in the opposite direction, because behavior technology is new, and the behavior-based industries are only beginning to emerge. There are many more behavioral scientists engaged in basic research and academic pursuits than in behavior technology. While this may be a transient phenomenon, we must nonetheless take action to correct it. We must persuade behavior scientists of the highest caliber, who are now engaged in basic research, to become behavior technologists. The argument that should persuade them, assuming that their primary loyalty is to the progress of behavioral science and to the increase in our fundamental knowledge about behavior, is that society will support basic research in behavior more generously if behavioral scientists can demonstrate that their science can be applied to practical problems. In the long run, the argument continues, basic research in behavioral science will be better off and farther along if it is far-sighted enough to temporarily divert some of its manpower resources to the task of translating the accumulated knowledge about behavior into practical benefits to society.