AUTOMATION ECONOMICS *

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«Social progress is impossible without economic progress; economic progress is impossible without technical progress; technical progress is impossible without investment.»

Jean Fourastié

The development of technology and industrial processes during the second and third quarters of the 20th century has been so rapid and far-reaching that contemporary writers have given it such names as «the second industrial revolution» and «scientific revolution in industry». One of the most potent factors adding momentum to this movement is the technical and industrial needs of war, cold as well as hot.

After the Second World War the application of electronic devices for the control of continuous and automatic flow of production and the utilization of self-controlling machinery came to be known as «automation». Delmar Harder of the Ford Motor Company was the first to coin the term in 1946 and soon the word caught industry's fancy. In 1948 Ruper le Grand discussed it in «American Machinist»; Norbert Wiener gave a penetrating analysis of it in his celebrated «Cybernetic» and the«Human Use of Human Beings»; John Diebold wrote his «Automation-The Advent of the Automatic Factory» in 1952; and automation became a live issue in the United States.

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To-day automation is being pursued actively in the United States and other industrial countries. The Soviet Union, with the establishment of a ministry of automation in 1956, is definitely intent upon catching up with the U. S. in industrial productivity. In Britain commercial banks have appropriated some £50 million for the application of electronic computers in banking. In France and Germany automation is being introduced in a variety of industries.

Automation has been defined by some as the control and co-ordination of the various stages of production in such a manner as to enable optimum use to be made, through modern techniques of communication and control of information, of all the factors of production. Others, following the «industrial evolution principle» consider automation to be the continuation of mechanization. Thus Dr. George Hartmann, of the Freiburg Institute divides automation into 6 progressive stages:

1. Classic mechanization: The substitution of external sources of energy for human muscular energy.
2. Advanced mechanization: Classic mechanization plus continuous production processes.
3. Complete mechanization: Advanced mechanization plus continuous flow.
4. Automatization: Advanced mechanization or complete mechanization plus automatic command.
5. Elementary automation: Automatization plus automatic control.
6. Complete automation: Elementary automation plus automatic regulation and correction through logical decision-making.

Whether automation is viewed as a distinct phenomenon separate from mechanization, or but a later stage of mechanization, the fact remains that the machine, which so far has taken over muscle-work, is now gradually taking over man's mental and logical decision-making functions as well. To put the features which differentiate automation from mechanization in bolder relief, the following chracteristics of automation are noted:

1. Integration of related processes.

2. Assignment of centralized machines for verification and control, and hence, reduction of the degree of dependence upon human intervention.

3. Automatic transfer of materials along assembly lines and the possibility of institution of continuous flow.

4. Automatic measurement of quantities and evaluation of qualities necessary for continuous flow.

5. Automatic processing of data, and the application of computers for mathematical calculations and inventroy control.

6. Possibility of control from a centralized unit and the application of remote control methods.

7. General contraction of plant size due to dispensing with inter-plant space and the resultant expediting of operations.

8. Transformation of the worker's role from that of an operator to that of a co-operator or «machine helper».

9. Complete interdependence between the various parts and components of plant units, each unit both assisting, and getting assistance from, other units.

10. Increased costs of modifications and alterations. This is a major cost item, for alterations in an automated plant are not only costly in themselves but the dismantling of components and the installation of new parts is a time-consuming operation, during which production rates fall and loss of markets ensue. Besides, before machines begin to run smoothly, some off-quality products are turned out which are not marketable and are a source of waste. Additional operators are required during the interim, and add to costs.

The Economic Effects of Automation

Productivity, production capacity, the human factor, wages, investment, prices, balance of payments, terms of trade, fiscal and monetary policies, and foreign exchange policies in underdeveloped and industrialized countries may all be influenced by automation.

Some observations on the effect of automation on production and the human factor follow.

Automation and production: The classical theory of short-run price determination which was based on the inter-relation of supply, demand, price and reasonable decisions of *homo economicus*, and which was already beginning to lose general applicability with the decay of classical competition and the advent of monopolies and unions, is being discarded under automation. This is because of the application of the principle of continuous flow which reduces short-run flexibility. For with such high fixed overheads it is no longer possible to adjust production to meet fluctuating market demands. Production will have to go on even in the face of declining because of the need to recoup part of the heavy fixed overheads. Thus a new element of market rigidity is bound to be added as a result of automation[1].

Automation and the Human Factor: Under the capitalist system automation at first is bound to displace the workers and cause some unemployment, but with the creation of new jobs and changes within the structure of the work force employment will reach and eventually surpass previous levels. Experience so far corroborates this view.

The effect of automation on labour's share of the probuct is a controversial issue. Opponents of machinism take the view that man is becoming subservient to the machine and that under the assembly line method of production it is the machine that guides the worker, reducing him to an involuntary agent. By the same token they argue that automation will further reduce man in the scale and that not only will his mental faculties and initiative be withered through disuse but that the very thought of utilizing them will gradually die out.

It is very probable that in an automated world the unskilled worker will have vanished; but higher human faculties, in the special sense of that of the expert, the specialist, the designer and originator of ideas, will find greater scope for exercise. All of which points to the need for facilitating the transformation in the structure of the labour force and increasing specialization.

1. The effect of automation on productivity and capacity of production has been discussed more fully in the Persian text, together with examples taken from «Automation and Management» by James Bright.

Labour will benefit from automation in the following ways:

1. Human toil and drudgery will be reduced.

2. Working conditions will be improved, cleaner workshops and more healthy surroundings will become possible.

3. Work will become more specialized and therefore simplified.

4. Automation will reduce accident frequency, and through remote control methods, accident severity.

5. Greater security of job tenure will be possible under automation, because:

a) There will always be a need for a minimum number of workers that cannot be discharged even when production is stopped. This minmum under automation is much higher than the minimum under previous systems.

b) To effect even small changes in production requires substantial planning and programming.

c) Reduced drudgery and physical effort causes less fatigue and thereby improves general efficiency and lenghtens the working life span of the worker.

d) Increased labour productivity is bound to transform labour unions and improve conditions to the advantage of the labour.

Thus it can be seen that far from being a menace to labour, automation will bring changes which will reduce drudgery and increase human welfare.

(to be continued)

REFERENCES

Books :

1. John Diebold, Automation— The Advent of the Automatic Factory, D. Van Nostrand Company, Inc, New York, 1952.

2. Robert N. Anthony, Automatic Data Processing Conference, Sept. 1955, Harvard University, Boston, 1956.

3. Lester R. Bittle & Morley G. Melden & Robert S. Rice, Practical Automation

Methods for Increasing Plant Productivity), McGraw-Hill Inc, New York, 1957.
4. Paul Einzig, The Economic Consequences of Automation, W. W. Dorton & Company, Inc, New York, 1957.
5. James Bright, Automation and Management, Harvard University, Boston, 1958.

ARTICLES:

1. John Diebold, Life Under Automation, *Challange*, December 1960, P. 20.
2. Dexter M. Keezer and Margaret K. Matulis, Industrial Giants of Tomorrow, *Challange*. December 1961, P. 6.
3. John Diebold, A Second Industrial Revolution (book review), *Challange*, January 1962 P. 45.
4. £ 50 Million for Automation, *The Economist*, 3, February, 1962, P. 436.
5. Arthur J. Goldberg, Automation—Threat or Opportunity? *Challange*, June, 1962, P. 15.
6. Dr. George Hartmann, L'automation et la Recherche Operationelle Dans L'economie Sovietique, *Problèmes Économiques*, No. 745, Avril 1961, P. 14.