

Some Thoughts on the Peculiar Economic  
Significance of the Information Revolution

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Each of us in the research game goes through life discovering—and noting down—all kinds of interesting phenomena. We record their occurrence, and frequently a correct explanation of them, in various 'data banks': lab notebooks, correspondence, articles, books, microforms, magnetic tape files, etc. We also store quite a lot of unique information in our own intracranial memory banks.

These stores of knowledge make up an imperfect, incomplete and fragile commodity. Ironically, the imperfection of knowledge increases the more we increase our efforts to make it less so. The need for knowledge grows as we gather more information to satisfy it. Thus, information is in a special sense a 'perishable' commodity. It is 'perishable' both in the sense of being deteriorable (like food) and consumable (like gasoline). The 'perishable' nature of information may be of enormous significance for our future economic health.

What has information to do with economics? The Industrial Revolution is past. We are in a Post-Industrial Society, on the threshold of the Information Revolution. Computers, automatic control systems, manufacturing automation—all presage a decline in the *physical* labor that still accounts for a large part of the cost of most commodities.

At the same time, we face a decline in material resources and cheap energy. It will no longer be feasible to produce the myriad widgets whose planned obsolescence has kept our economy going unless reclamation techniques are vastly improved. The energy-resource crisis and the prospect of less consumption has had profound effects on Wall Streeters. But while the non-consumption of goods causes gloom in the industrial boardroom, the information industry is prospering as never before.

Indeed, Machlup, Anderla, and others have forecast a continued exponential growth in the production and handling of scientific and other types of information.<sup>1-3</sup> In 1962, Machlup reported that the 'knowledge industry' already accounted for 29% of our GNP. Since then, as one of the 'white-collar service industries', it has been growing quite rapidly.

The prospect of exponential increase in information may cause a sigh among those who already feel overburdened with information. I too wonder about so-called information overload and resultant psychosocial stress.<sup>4-5</sup> But I wonder and worry with an optimistic viewpoint.

The production of information *does*, of course, consume resources and energy. The research community is

as ecologically balanced a system as any other.<sup>6</sup> One research team may put in twenty years of labor to produce one journal article. But the energy and material resources consumed in the process must be minimal in comparison with those consumed daily by factory teams converting tons of iron, rubber, and petroleum products into automobiles and work-saving (and energy-consuming) appliances. Perhaps some reader knows of research on the resource and energy requirements of a 'typical' research project, and will let me know about them. What resources and how much energy does the average scientist use to produce the average paper? How many rats, test tubes, instruments are used? How much paper for printing? How much electricity and other forms of energy? The average scientist spends most of his time using his brain. Today very little *physical* energy is required of the scientist. In the past, even scientifically simple laboratory tasks often required enormous physical effort. Think of the Curies shoveling tons of ore!

As the scientific and technical literature grows, more and more scientists will become 'theoreticians'. They are a new breed quite distinct from 'bench scientists' and laboratory technicians.<sup>7</sup> The terms 'laboratory scientist' or 'bench scientist' one day will become self-contained contradictions. I once discussed this distinction in terms of wet and dry information.<sup>8</sup> Even now, increasing numbers of scientists are becoming 'information scientists'.<sup>9</sup>

Again, what has all this to do with economics? On the threshold of the Information Revolution, in the midst of a rapid growth of the 'knowledge industry' (and of service industries in

general), we have done little or nothing to prepare society for a decline in physical, blue-collar work. We are all aware of the economic impact of strikes on the worker. Perhaps of deeper import may be the psychological impact of prolonged strikes as a foretaste of the blue-collar decline. What is the effect on the self-image of the blue-collar worker as he confronts the Information Revolution?

This problem touches us all, and the stereotypes we live with and by. In Philadelphia there are thousands of unemployed young men willing and able to do pick-and-shovel work or almost any form of 'manly' labor. Yet our pleas for male data-entry operators and clerical workers go unanswered. Obviously one of our difficulties in dealing with the social consequences of the Information Revolution will be its requirement that we build a new image of the white-collar worker--physical, mental, and emotional. Perhaps we have begun to do so--perhaps that is one aspect of the deeper meaning of the 'sexual revolution'. Would we today find Marlon Brando's Stanley Kowalski any less convincing were he an ISI indexer rather than a machinist?

According to Marxian and some other analyses, increased productivity will lead to surplus, and surplus to the market's incapacity to absorb the output of production. This hypothesis of the downfall of capitalism may be purely academic if capitalism is denied the resources and energy 'productivity' requires. Workers will not then, as predicted by Marxian doctrine, revolt under continuing pressure for greater productivity. For different reasons, they will be unemployed. If govern-

ment intervenes to create employment, the intervention may be equally academic as an economic solution, if we are without resources and energy.

What would be the effect, however, if displaced workers were used to create and process information? As I have said, almost any use of information requires more and produces more. As the population becomes increasingly educated, we can expect that *more* people, not less, will go into research, or into some lesser area of the 'knowledge industry'. More information will be generated. More people will be required for its analysis, storage, correlation, communication.

If we don't take advantage of the potential of the Information Revolution, we had better get ready some labor-intensive projects like the pyramids. While we are at it, we had better

also redesign our educational system. Indeed, several recent papers have suggested this is what is happening—a depressing thought.<sup>10-12</sup> We educate, graduate, and train information processors, but are quite unprepared to absorb these information processors into our work force.

These amateurish wanderings into sociology and economics may be subject to instant criticism by experts. What about the different impact of capitalist and socialist systems? Whatever the criticism, however, it can certainly be stated categorically that the economics of information and the knowledge industry has received inadequate attention in the scholarly press. "The politics of knowledge may be the politics of necessity in a society more interconnected and complex than anything we ever imagined."<sup>13</sup>

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