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MAJOR TRENDS AND PORTENTS RELATED TO INFORMATION COSTS

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Let me annotate the curves you have and touch on some of the trends and portents related to information. Several of these we intend to dig into in the new Special Interest Group on Costs, Budgeting, and Economics.

Trends in Federally Supported Information Activities

Expected Leveling Off of Federal Government Support. Funds for research and development are drying up, as is hardly a secret these days; so we may expect funds for information to run parallel. (See Fig. 1.) We may expect, as a matter of fact, that scientific and technical information may be harder hit than research and development. Buggest chunk of federal money supporting information activities has come from the Department of Defense, and it is DOD that is very likely to be clobbered the hardest. (See Fig. 2.)

We could expect information activities to remain flat for a while because research and development in the sciences is going to remain flat for a while.

However, this hasn't yet come about in either the federal or private sector. Examples of activities that continue to rise at exponential rates are number of abstracts in Physics Abstracts and documents sent out by the Federal Clearinghouse. See Figures 3 and 4.

A reason why we might expect leveling off of support for information to

continue for quite a while is the general law concerning social phenomena with exponential growth: after a while they reach saturation, and the exponential growth curve flattens out. (See Fig. 5.) One of these days the information explosion is going to be over.

So the leveling is imminent but hasn't happened yet.

Increase in Information Services. A change in the mix of activities within federally supported STINFO activities can be noted. At the beginning of the 1960's publication and dissemination had been supported the heaviest--about 50% of all STINFO funds. By 1970, however, information services had risen to approximately 50% and publication and dissemination had fallen to something over 25% of the total expenditure. (See Figure 6.) Information services have grown as the new documentation activities have been introduced throughout the federal establishment to satisfy the needs of scientific programs. They have been extended in depth and coverage and have entered upon costly mechanization.

Related to the growth in information services has been the growth in research and development--largely computer research. It has doubled in ten years--from 7% to 16% of the total.

Adding the two--information services and research and development, both largely computer oriented activities--we can account for two thirds of the money spent by the federal government on STINFO. However, these numbers should not be swallowed whole from this hasty analysis: for instance, computer

research money is being spent for photocomposition to support publication.

Parallel Trends of STINFO and Data Collections. Another trend to which STINFO is related is that of the increase in federal obligations for collection of general purpose data. (See Figure 7.)

> Obligations for general-purpose scientific data have grown from 1962 to 1969 at an average annual rate of 9 percent but generally at a decreasing rate....The overall growth of Federal funds for general-purpose scientific data is a reflection of an increased demand for accurate, comprehensive, and timely information on both the physical environment and the socioeconomic facets of modern society. This demand for more data comes from within and from outside the Federal Government and represents, in many cases, efforts to solve some of the pressing problems of the present time--water and air pollution, poverty, and crime, to name a few.[1]

If you discount the increase for the Bureau of the Census for the 1970 national census, the curves for STINFO and collection of general purpose data are almost parallel. Just about what you would expect: If data is collected, then use will be made of it, and will show up in STINFO obligations. However, it should be pointed out that some increases in both of these categories results from activities formerly buried in scientific research projects now being identified as STINFO or data collection and analysis.

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[1]Federal Funds for Research, Development, and Other Scientific Activities Fiscal Years 1968, 1969, and 1970. National Science Foundation. NSF 69-31.

Costs and Budgeting. Programming, planning, and budgeting (PPB) is now required for most federal agencies, and will soon be required for all. For instance, the 1969 Joint Congressional Economic Committee report recommends:

> "We urge the new administration to make every effort to strengthen the PPB System, increase the capability of the Bureau of the Budget and executive agencies to implement this system, and provide incentive for its effective functioning." (2)

A price tag can, after all, be put on anything. And I'm not saying that human values have only the value of the price tag. There is nothing degrading--though many information managers seem to have the feeling that there is--about making the most of the dollars that came your way, or trying to get more to come to you, and giving values in dollars for what dollars buy.

Cost in dollars is not to be equated to the subjective and psychological value of information for each individual researcher, anymore than for adequate medical insurance, a safer place to work, well-kept building and grounds, and not having the smell of garbage wafted through his window on spring mornings.

PPB demands that you project cost benefits and that demands imagination as much as analysis.

Functional Merging of Information Activities

Technical Information, Data Collection, and Analysis Activities Merge. Collecting, analyzing, publishing, distributing data in printed form or in

microform or magnetic tape tend to be increasingly done by or in cooperation with the technical information operation.

For example, we at Berkeley--like many other research laboratories--are trying to set up an environmental research institute, and in it we propose a comprehensive information activity that would include (1) conventional technical library activities; (2) collection and searching of various data bases and indexes available for computer manipulation; (3) making compilations and summaries of data; and (4) detailed data analyses and review articles. These operations would't necessarily or even probably be set up as a unit, functions would be performed by several groups in the Laboratory.

Technical Information and Public Information Activities Merge. The difference can no longer be maintained between technical and nontechnical information. For instance, in the national campaign now being waged to clean up our air and water and keep them cleaned up, much of the highly technical material--chemistry and physics--have to make as much sense to the nonchemist and nonphysicist as they do the chemist and phsyicist and engineer. Not only do they have to make sense, they have to be understood well enough by the nonspecialist so that effective action can be taken.

Informing, training, selling--convincing people to act--all merge. You not only want to tell a person a fact, you want to convince him to do something about it, and then show him how. Consequently, the trades of scientific and technical information (STINFO) specialist and public information (PI) man both have to shape their products for a multi-component audience, an audience which includes the audiences both have previously dealt with. All of the media become of equal interest.

What does this merger of STINFO-PI activities mean for costs? It means that public-information type of costs--those related to informing, training, and selling to the nontechnical audience--will increase relative to straight technical-information costs. Because the leveling off is not to be expected in the information required as we try to alleviate pollution, crime, and other social hazards of our time.

From management's viewpoint, then, all information activities tend to be thought of as one package, however spread out in location or supervision. It's only we specialists who want to fragment them. Cost comparisons can, consequently, be expected. And cost benefit comparisons. An example of management's thinking along these lines can be seen in the recent merger of technical and business information activities in the Department of Commerce's new National Technical Information Service. NTIS incorporates the Federal Clearinghouse for Scientific and Technical Information.

All Media Are Go. Much time and breath is wasted among information people contending about which media, techniques, procedures, equipment will survive or dominate. They are all going to survive and the particular situation will dictate which will dominate. Television was going to do away with both movies and radio; but today both radio and movies are obviously with us to stay. Demise of hard copy has been prophesied year after year for the last couple of decades, but the tenacity of almost everybody in insisting on having hard copy seems to indicate that it too will survive.

What is the right mix? That is and will be the big question for the manager of information systems. And the right mix is increasingly going to be the mix with the right cost.

Buy Services Rather than Build an Empire. One way to get the right mix of services is buy what you need when you need it. The more that the information manager buys services, equipment, products, the better he will be able to know his costs and budget his own expenditures. Vendors are in business to sell for a profit; they know what their services and products cost and upon request will quote you firm prices.

Newer organizations such as the Department of Health, Education and Welfare; Housing and Urban Development; and Transportation, are buying--or should be buying--services rather than installing their own equipment, or hiring their own people--except as coordinators. These organizations should be farming out all possible information activities. NASA has farmed out its report dissemination for years. National Agricultural Library announced recently a computerized current awareness service that the Institute for Scientific Information is going to handle.

No need to develop your own computerized systems from scratch. Today, increasingly, the information manager can take advantage of commercial computer development. Not exactly off the shelf, but close to it. For example, McGraw-Hill recently signed an agreement with United Computing to store data from a number of its books and technical publications in the memory bank of United's computer in Kansas City. The computerized publication will be accessible to hundreds of users simultaneously through a multiplexed telephone circuit. To find a fact or formula instantly, an engineer simply dials a local telephone number and is connected directly to the United data center. The computer provides the answer immediately through an acoustic coupler and printer.

And what you can't buy today, you will be able to tomorrow. Information managers can help speed the process by shopping around, convincing vendors that if such and such services and products were available, not only would they buy them but so would many others.

Information Industry Concept

The catching hold of the concept of the "information industry" is one more major aspect. It might be said to begin with Machlup's book in 1962, The Production and Distribution of Knowledge in the United States. It has recently been acknowledged by those in the trade by the formation of the "Information Industry Association."

It's hard to decide what exactly we should consider as the conventional, classical information industry. An exercise for somebody is to take Wassily Leontief's input/output charts as published by Office of Business Economics of the Department of Commerce and piece together the inputs and outputs that make up the information industry.

If we are now an industry, then we had better start coming up with costs. For one mark of an industry is that it knows its costs.

Time Ripe for Improved Costs Analyses

Time is ripe, then, for the information manager to devote his attention to sophisticated cost analysis, both of the big chunks of his system and of

its smaller components, both for cost accounting and cost benefits. He can do no better than follow the recommendations of the COMSAT report.

STUDIES OF COST AND VALUE

Particularly important among the recommended studies will be those addressed to factors of cost and value. The difficulty of developing quantitative measures of the value of information services... suggests the need for greater ingenuity and more-systematic procedures in the conduct of such studies. In situations in which a free market exists, the price the user is willing to pay for different information services provides a measure of such factors; however, this measure must be viewed with caution until the behavior of users, especially so-called "in a rut" behavior, is better understood. Collections of offhand opinions of scientists and technologists about the information services they think they want have little utility; often such opinions call for an exhaustive service when a less comprehensive but more reasonably priced one would be more valuable, or for an exceedingly fast service when a slower but cheaper one would be a better buy.

RECOMMENDATIONS

Develop measure of value for information services that embody various combinations of accuracy, completeness, discrimination, timeliness, and similar factors. These studies should include experiments on user response to new services. The facility of providing additional specialized information services at appropriately scaled prices should receive particular attention.

Studies should be initiated to determine the relative costs of different methods of storage and transmission of recorded information.

ASIS SIG/Costs, Budgeting Economics Can Assist

Formation within ASIS of the special-interest group on costs, budgeting, and economics should help to get studies under way. We welcome any suggestions. Write me, phone me, or nail me before this 33rd annual meeting of ASIS closes today.

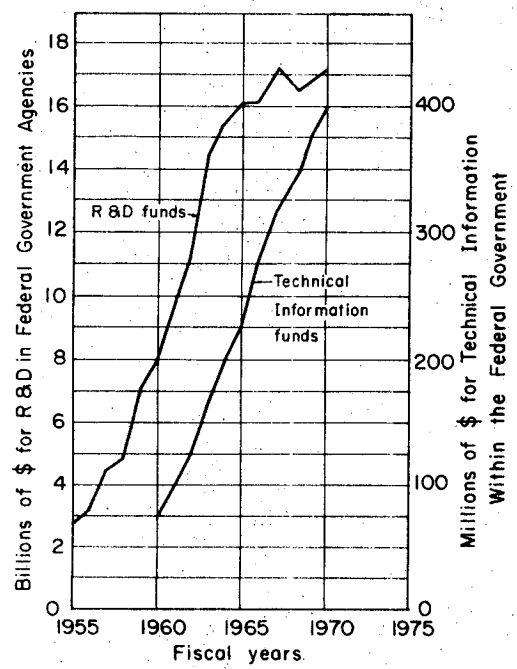
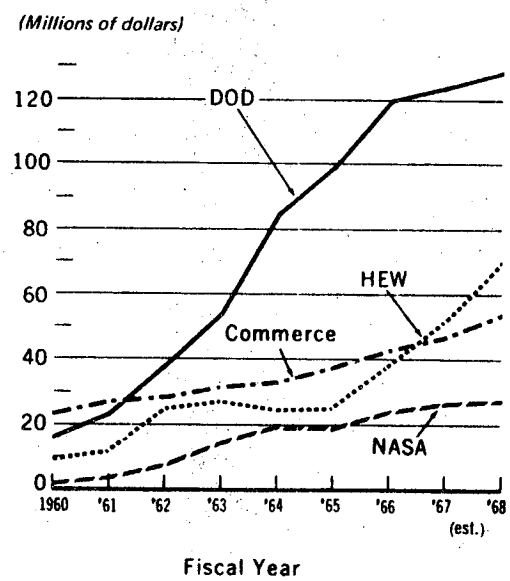


Figure 1. Growth in obligated funds for research and development activities and technical information activities in the federal government 1960 to 1970. Flattening of the information curve parallel to the research curve can be expected. (Sources: Bureau of the Budget and the National Science Foundation)



SOURCE: National Science Foundation

Figure 2. Trends in federal obligations for scientific and technical information, by selected agency.

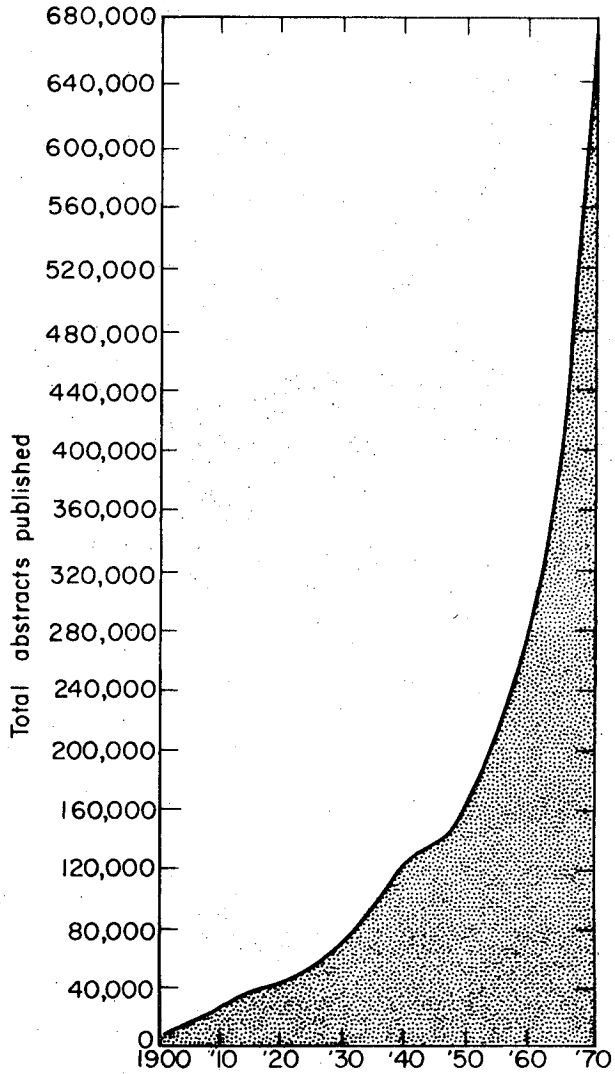


Figure 3. Total number of Physics Abstracts published since January 1, 1900. Data since 1948 added to original from D. J. deS. Price's Science Since Babylon. New Haven, Yale University Press. Here it is, the ultimate exponential curve.

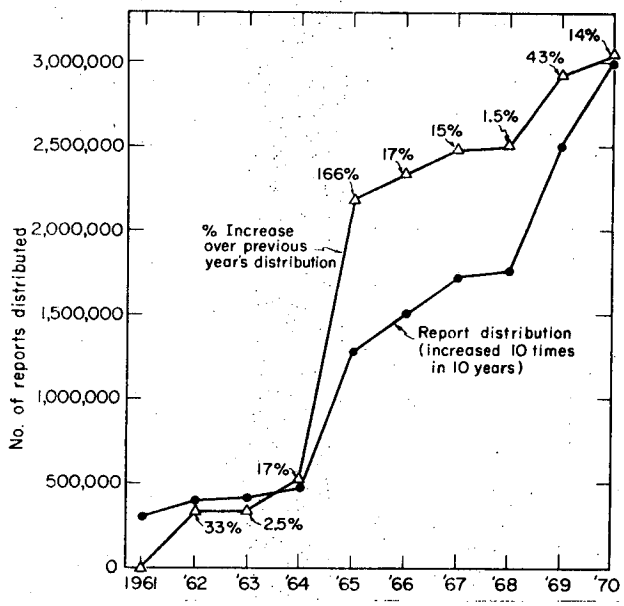


Figure 4. Growth in dissemination of reports by Clearinghouse for Federal Science and Technology. Source: Clearinghouse for Scientific and Technical Information.

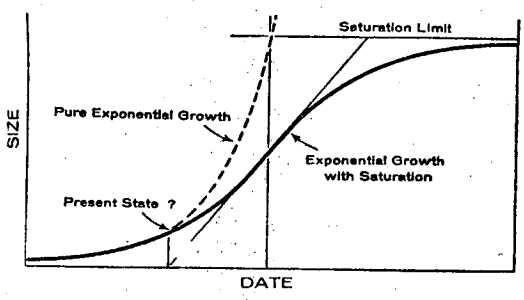


Figure 5. Exponential growth with saturation. Such growth is typical of automobile registration, number of scientists and television sets, and scientific and technical information activities. (From Science Since Babylon, by Derek John deSolla Price, Yale University Press, New Haven, Connecticut)

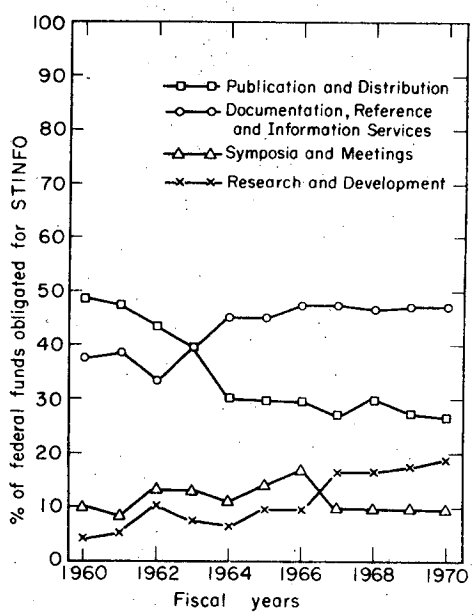


Figure 6. STINFO by category 1960-1970. Source: National Science Foundation.

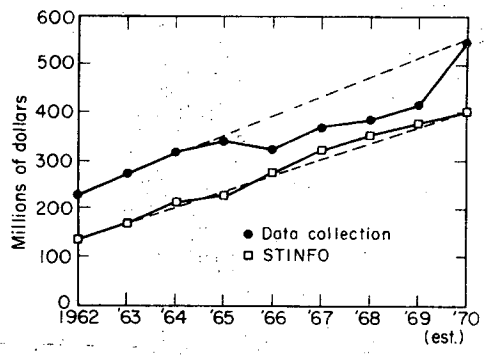


Figure 7. Federal obligations for collection of general-purpose scientific data and STINFO FY 1962-70. Source: National Science Foundation.

TABLE I. THE GROWTH PATTERN OF ABSTRACTS PUBLISHED BOTH IN NSA AND ITS CLASSIFIED COUNTERPART, ABSTRACTS OF CLASSIFIED REPORTS (ACR), SINCE 1948 [a]

Year	No. of abstracts published	Increase over previous 5-yr period
1948	2522	
1953	6710	160%
1958	17960	168%
1963	42427	136%
1968	53507	26%

[a] An Analysis of World-Wide Contributions to Nuclear Science Abstracts, Vol. 22 (1968), Rep. TID-25004.

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