

The Fix is Information, Now What Was the Problem?

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Note: This is the actual text of the paper as delivered. As you can see, it was designed to be a provocative oral presentation rather than a publication. Routledge is producing a book from the conference, which will contain a different paper (provisionally entitled One Fix for Many Problems: Information Technology and the Managerial Environment, 1973-1990) which includes most of this material but gives a much fuller account of the last of the three eras discussed here.

I should say something about my aim in this talk. Rather than present a single chapter of my dissertation, I'm taking some of the most crucial ideas from the thing as a whole (it is about 800 pages) and trying to give a sense of how they run through the work entire work. This is based on more specific material I have presented and published elsewhere, and will be briefly summarizing here. In doing so, I want to amplify some of this earlier work by showing some remarkable historical continuities concerning proposed fixes based on what we would now call “information technology.” The fact that ideas many think of as novel, such as “reengineering” business processes, date back to the 1950s or earlier surprised me, and I think I may surprise you. My other big surprise was that ideas I think many of us subconsciously assume are in fact older, such as “information technology”, “information system” and – in many of its modern senses – information itself turn out to be more recent creations.

Few, if any ideas are today so ubiquitous, so powerful, and yet so ill-defined as that of information. Canny observers, such as Langdon Winner, Geoffrey Nunberg and Philip Agre have explored the strange qualities attributed to it. The found three vitally important things. First, information is generally presented as a “curiously inert substance” – floating value-free above politics or parochialism. More information is always better. For example society's obligation to pipe information into deprived pockets to bridge “the digital divide” gains broader support than the idea of a universal right to health care or to decent housing. Second, talk about information is inextricably bound up in specific technologies. When people talk about information they are really talking about computers, or as they and their attendant paraphernalia of networks and software are now dignified, “information technology.” Indeed, as Rosalind Williams recently noted in *Technology and Culture*, when uttered by a corporate or academic administrator the very word “technology” has narrowed to mean computer. Third, behind the ostensible neutrality, rationality and impersonal efficiency of information lie an ugly mess of camouflaged interest and values. Information, I suggest, enjoys roughly the same position in contemporary American discourse that progress, with a capital P, enjoyed 90 years ago. Future historians will find it to be just as ideologically loaded and just as hard to define.

One would expect historians to have trampled each other underfoot in the rush to explain how the ideology of information came to enjoy its current preeminence. We remain, however,

oddly uncrushed. Historians have not, as yet, successfully applied their disciplinary tools to information as a concept. We are, for the most part, temperamentally averse to the ahistorical triumphalism that accompanied the new economy bubble of recent years and the cyber-libertarianism of Wired magazine. In this vein, scholars such as Joanne Yates, Richard R. John, Daniel Headrick and Martin Campbell-Kelly have done sterling work to show that the information age can be more convincingly dated to the 18th or 19th centuries than to the 20th. Yet, despite their merits, work of this kind inevitably serves to naturalize and universalize modern concepts of information, obscuring the actual process of its historical emergence.

In this paper I sketch the career of information in one specific social setting, the American corporation – asking what for what purposes it has been enlisted, and by whom. To invoke the theme of this conference, a series of technical fixes have been offered to management as the embodiment of information. From the humble card file, through the punched card machine and the management information system, to the mighty data warehouse, each in turn was promoted as a machine that would take the guesswork and subjectivity out of decision making. Each was expected to remove organizational politics and disagreement from the world of management. Each was brought and sold on the basis of essentially the same claim: that there is no business problem that cannot be solved by enough information delivered to the right place at the right time.

I explore this process during three different eras – each a chapter or set of chapters in my dissertation. I have no time to do more today than to note for each the most heavily touted administrative technologies and key groups of corporate specialists. In each era, faith in these technologies as a fix has been driven, in part, by corporate specialists seeking to stake their own claim to managerial relevance by re-designating the technologies under their control as key elements in a new approach to management. The title of my dissertation is “Technology, Information, and Power: Managerial Technicians in the American Corporation” and these groups of specialists are the different cohorts of “managerial technicians” it refers to.

The first, the 1910s-20s saw both a boom in the office equipment industry and the emergence of the scientific office management movement. The second, the 1950s and 1960s saw the arrival of the modern digital computer and with it the concept of the management information system and, I claim, the modern concept of information itself. The third, in the 1980s, saw the arrival of the personal computer and the establishment of large-scale corporate computer networks. With this came the CIO, called the “broad gauge information executive of tomorrow”.

And yet, as historians, we must not let a sensitivity to the ironies of history blind us to the very real changes that do occur over time. The main area of change I will explore today is the emergence of the concept of information itself. Information was constructed, during the 1950s, as a conceptual category within the world of business only through the efforts of specific groups of managerial specialists. These efforts were, in turn, prompted by the new technology of the digital computer. In this sense, the computer was not created to solve information problems. Rather, information problems were constructed to employ the computer. Information was not a question but an answer.

(flip to title)

1: Office Management

Thanks to the work of Joanne Yates, to scholars of office labor such as Margery Davies and Sharon Strom, and to the social history of the corporation pioneered by Olivier Zunz, we understand that period 1880-1920 was crucial era in the reorganization of administrative activity. This was, above all, the era of systemization and mechanization in office work. New technologies include such now taken-for-granted devices as the typewriter, vertical file, carbon paper, duplicating machine, and telephone. New administrative tools, such as the pre-printed form, the graph, the organization chart and the written procedure entered general use for the first time. These technologies were promoted eagerly by the office equipment industry, using claims very similar to those later made for so-called “information technology.”

Many of the parallels between the 1920s, the 1950s and even the 1980s are quite startling – even though the technologies involved are so different. This picture shows an office in clear need of a technological fix, even though the idea of a “high speed file” seems a little incongruous today.

(high speed file picture)

Consider this 1932 advertisement for Acme file cards. The technology seems ludicrously mundane to us, but the claim is very similar to those made for information technologies during the .com era.

“... Acme visible records force their owners to use the facts - profit by them, save money by them, stop losses before they get started.... Its successful operation in your business will be automatic...”

Their salespeople were trained to subtly flatter management, conducting apparently elaborate examinations of current procedures that would conclude that no real reorganization was necessary other than the installation of the new machinery or forms. (I got this information from a training manual surviving in the Hagley archives). If operation, aided by the quasi-consultants of their sales force would be “automatic” then one hardly needed to seek more fundamental managerial reform.

This message was anathema to the office management reformers of the period. These men, of whom the best known was William Henry Leffingwell, took this chance to argue that the new scope, importance and technical nature of office work justified the creation of a new executive, the office manager. Leffingwell dismissed the salesmen as “quacks” pushing “snake oil”.

(Leffingwell saving picture)

Basing his arguments largely on the scientific management approach promoted by Frederick W. Taylor, Leffingwell promised huge boosts in productivity if firms would concentrate authority over all clerical and administrative work in the hands of a single specialist skilled in the new “science” of office management. (This was, of course, the golden era of professionalization and expertise in American society, so the office managers were far from alone).

The office managers were the first group of corporate specialists to attempt to turn mastery of the techniques and technologies of efficient paper processing into a claim to broader executive authority – the first group of “managerial technicians” to set up camp in the world of

corporate administration. For them, the technology was only a means to the end of efficiency – and not necessarily the best, one. Only if the office itself were transformed into what one of their number called “a well oiled machine” could these superior cogs play a useful part – the same concept embodied in the recent craze for administrative “re-engineering”.

The office managers of the 1920s shared many prescriptions and ambitions with later generations of corporate specialists. They promoted themselves as experts in managerial systems. They claimed that technology was worthless without real business redesign. They argued that their own expertise bridged technology and management, and on this basis they aspired a redesign of the organization chart in which they would win a top position. These continuities are striking, and largely overlooked even by historians. As this organizational chart, taken from an office management textbook of the 1920s, shows they even went to far as to depict the office as a key department of business, to be headed by an executive the equal of those responsible for sales, production or finance.

(Org chart picture)

They did not, however, enjoy great success (this is not necessarily the consensus of the existing literature, but I have good data and will have to ask you to read my paper on-line). For today’s purposes I will focus on one crucial difference between them and these later specialists: neither the tangible organizational powerbase of the computer nor the concept of “information” as an area of expertise bridging management and technology were available to them.

Reading the literature of the period, this is quite striking. Through the early 1950s, discussion focuses instead on concepts such as “administrative fact power” which seem quite ungainly in comparison. Neither the salesmen nor the management reformers ever talked about information. This 1920s advertisement gives a good example.

(“There are the facts – Now You Decide!” advertisement)

Clearly alternatives such as “fact power”, “knowledge” or “intelligence” were important ideas, but they did not unite card files with bookkeeping machines, typewriters, punched card machines etc. in the way that ideas such as “information system” were to later on. The term “information” has a very minor role in the pre-1950 business literature, and never to denote something processed, stored or manipulated by a machine. Instead, the office managers had to rely on appeals to science, to the power of “systems” and to improved efficiency.

2: Management Information Systems

(Univac advertisement)

By the late 1950s, thousands of American corporations were rushing to install the unproven and expensive technology of the electronic computer. One high-end administratively oriented computer and its attendant peripherals cost about \$2 million dollars, and required the employment of dozens of supervisors, analysts, programmers and operators. Although computers were sold from the start as the tools of a managerial revolution firms of the 1950s were too busy grappling with the unexpected complexities of programming and analysis work to change their business procedures very much. The computer was used more as what I have called [flash up IEEE cover, image of article] a “Chromium-Plated Tabulator,” an expensive way to automate existing manual and punched card based systems. Organizationally, computers were grouped together with conventional punched card machines in newly formed “data processing departments” – guaranteeing their conservative application.

Around 1959, a powerful coalition began to emerge around the idea of the computer as the heart of the “management information system” (MIS) or, as it was often called, “totally integrated management information system” or just “total system.” It was supposed to deliver every manager in the firm with every piece of information he required to do his job, updated instantly, including models, simulations and external information as well as the routine crunching of figures associated with data processing. Note this shift in corporate computing terminology from the “data” of routine data processing to the more managerial and exciting “information” of MIS.

(Picture and citation for BHR article)

Parenthetically: I’ve dealt with these systems men before, in a presentation to SHOT and in a major article in *Business History Review*. I don’t want to give the same paper again, so giving only very concise summary of it here, but I do want to flag that it was in this article I made and supported the claim that the modern corporate sense of information systems, management information and information specialists originated during this era and under these conditions. The BHR paper includes more detail, supporting evidence and footnotes.

Initial proponents included management consultants, representatives of computer vendors, business school professors with interests in management and technology, and administrative specialists within the U.S. Navy. MIS was inspired in large part by the success of large command and control systems built by aerospace and “systems engineering” firms of the cold war. Nevertheless, the idea found its most enthusiastic proponents among a new breed of corporate specialists in administrative methods, the self-proclaimed “systems men” of the Systems and Procedures Association of America. Unlike office managers, these men disdained clerical supervision, and instead tried to use the newly common role of staff expert to set procedures and systems across the firm as a whole. (In a paper I present at SHOT in two weeks time, I’m focusing on the relationship of these corporate specialists to the elite cold war systems community explored in the most recent books of Thomas Hughes).

The systems men loved MIS because it promised to gain them the resources, glamour and visibility associated with the computer without making them give up their pretensions to address the managerial systems of the firm as a whole. They didn’t want to process data, but the new idea of creating “total” information systems seemed a lot more tempting. This meant that the system designer would gain technocratic authority over the very structure of the firm, and control every aspect of its administration. It also promised organizational elevation of the same kind the office managers had pursued, and brandishing sample organization charts, its proponents called for the creation of a VP, MIS. MIS was something that both management reformers and machine salesmen could, and did, promote.

By the mid-1960s, the MIS concept was the cornerstone of any managerially-oriented discussion of the computer. The idea was also seized upon by computer marketers, eager to promote a new “third generation” of computer hardware. Just like file systems of the 1920s, except much more expensive, the computerized information systems of the 1960s were to serve as a panacea for the problems of management.

“When complete information is available, the policy or decision may already have been made. Another way to say this is the facts speak for themselves and require only a formal acceptance and stamp of approval by the line executive rather than a decision.” (Article promoting the management information system concept, 1962)

An extreme form of this can be seen in this series of Univac advertisements, which ran in Fortune and Business Week in 1965. The sprawling corporate organization chart is compressed, symbolically, into a single reel of computer tape. This captures a common pitch, that MIS could reverse the trend toward decentralization and give corporate headquarters the power to reign in divisional managers.

(Univac Total MIS advertisement)

In this advertisement, all the messy complexity of a sprawling multi-divisional business has been collapsed into a stylized representation of a reel of computer tape. The text on right reads *"Your business with a Univac Total Management Information System. Management is no longer the remote apex of a pyramid but the hub of a wheel. Lines of communication are direct. Every area of activity is monitored on an absolutely current basis. And centralized control of decentralized operations becomes a reality. Painlessly. There are three grades of distinct Total Management Information Systems...known collectively as the Univac Modular 4000 Real-Time Systems."* Note the conceptual slippage by which computer hardware was now promoted, in and of itself, as a total Management Information System.

Also notice the attempt to fix the information problems of the firm as a whole. The problem definition took place at such a broad level – not enough information fast enough – as to make the diagnosis of more specific problems unnecessary. Only a “total” MIS could address the implied problem.

One consultant, promoting a mix of computer technology and interior design, made even more dramatic claims for his “on-line decision environment”. It would foster *"a more relaxed, leisurely management environment. The uneasiness will be replaced by a feeling of confidence in the completeness and timeliness of information and in the decisions based on that information.... If sufficient data has been included in the mathematical expressions placed inside the computer it will be increasingly possible to actually complete the decision process on major commitments in a single, relatively brief management meeting."* Mankind, he promised, had the chance to *"return to a higher state of the human condition unknown since the Greek and Roman cultures."*

In its earliest usage, the management information system was so-called because it would inform managers. (This is, after all, the root meaning of information). But this sense mingled increasingly with a new sense of information as a quantity existing in the world, processed and stored electronically. Where did the new meaning of information come from?

(Graphic of 1953 Fortune advertisement)

The answer lies in large part in the then-fashionable realm of information theory, introduced to the world of American management in this 1953 Fortune article. Information theory (itself shaped by telephone technology) and the “systems approach” were intimately bound up with the equally fashionable concept of cybernetics, and both were closely associated with the electronic computer. Thus, although managerially sophisticated proponents have always argued that information is a technology-neutral concept, its entire career as a managerial idea has been inextricably bound up with the computer technology. Indeed, its very appeal came largely from its ability to demarcate an area of expertise in which “information systems” (managerial) and “information technology” (machines) were inextricably intertwined. (It should be pointed out that in this era librarians were also trying to win a managerial niche on the basis of

information expertise – again this observation is further advanced in my already published work).

Contemporaries were well aware of the novelty of this new sense of information. Alex W. Rathe, a professor of office management at Columbia who was among the first to develop an interest in the new topic, claimed that, *"As late as 1946 there were in the combined professional, technical and scientific press of the United States only seven articles on the subject of information."* They were equally well aware of its ties to computer technology. As Dun's Review pointed out to the world of industrial management in 1958, *"only in the past dozen years has the concept of information--as distinct from the papers, forms, and reports that convey it--really penetrated management's consciousness. That is has done so is largely due to recent breakthroughs in cybernetics, information theory, operations research, and the electronic computer...."*

(flip to title)

3: The Chief Information Officer

Through the 1960s, corporate computer staff remained (like the office management staff before them) very concerned about their department's place on the organizational chart – as an index of their authority and the extent to which they had won recognition by executives.

(flip charts showing upward rise of the data processing department)

These organization charts used as part of a talk at a 1969 conference are an interesting illustration – the author suggested that the manifest destiny of the corporate computing department was to rise from the bottom chart (lower recesses of the accounting department) to the top one (the one and only department reporting directly to the chairman).

Despite all the attention given to MIS, actual managerial use of computers was still dominated by routine clerical activities well into the 1970s. Computer departments had risen some way up the ladder [show mobility charts] but never as far or as fast as their boosters hoped for. Data processing managers spent much of their time complaining that they got “no respect” from other managers, and were viewed as mere technicians rather than equal partners. Renaming data processing departments as MIS departments, which many firms did in the 1970s, was little more than a cosmetic operation which had the side-effect of tainting the MIS tag with all the bad associations that had accrued to DP.

By the mid-1980s, many were convinced that the answer lay in the creation of a new kind of computer department headed by a new kind of executive, the CIO or Chief Information Officer. Bill Synnott, author in 1981 of the first book to promote the idea, defined this as the “Senior executive responsible for establishing corporate information policy, standards, and management control over all corporate information resources.” The most important characteristic of the CIO was that he or she report directly to the president or CEO of the firm.

The new role was often justified through explicit reference to the ever-rising status of the CFO, and the comment that information was just as valuable as money to corporate success. Despite a slow initial spread, by 1986 the CIO term had broken into the business media, and by the late 1980s a host of books, consulting reports, workshops and the glossy and newly launched CIO Magazine were promoting the concept. Needless to say, ambitious computer specialists proved its most eager consumers.

(Cover of CIO magazine)

More general enthusiasm for the CIO was bound up with the idea – common in the late 1970s and early 1980s, that the proliferation of microcomputers and microelectronics signaled the dawn of the “information age”. As the opening of Synnott’s book stated, “*A quiet revolution is occurring in the data processing industry. The computer era of the 1960s and 1970s is giving way to the information era of the 1980s.*” The focus, he insisted, must shift from machines to information.

Many suggested that the best CIOs might have no experience with computers at all – the idea being that this might lead them to feel too close to the technology and not close enough to the business value of information. One of the earliest articles to explore the CIO concept, a 1983 piece published in a corporate computing magazine, was titled “Executives to Unlock Technology’s Promise.” It opened with an imaginary job advertisement. “Wanted: Chief Information Officer. Prerequisites: general management experience and ability to implement the latest in information technologies. Technicians need not apply.”

The data processing manager (or, for firms with more modern terminology, VP-MIS) was painted as an outdated figure tied to the concept of a feudalistic information monopoly in which a central mainframe ruled over by a small elite was the only source of computer power. Instead, the “broad-gauged information executive of the future” would focus on corporate-level issues, allowing departments to select and operate their own hardware and build local systems as needed. The three vital areas for the CIO were the coordination of corporate data bases stuffed with information for the firm as a whole, the setting of standards and policies for computing throughout the firm, and the operation of the network infrastructure needed to link everything else together.

This change was accompanied by another technological shift – away from the mainframes that dominated administrative computing through the 1970s and toward what were first called “distributed systems,” then “client-server technologies” and finally “n-tier architectures.” The idea was to link together computers of different kinds, keeping large databases on centralized mainframes while using microcomputers or “intelligent” terminals to build interactive interfaces and minicomputers as departmental hubs. This concept also headed off claims made by microcomputer enthusiasts that their machines rendered centralized computing groups an expensive irrelevance.

Yet the ubiquity of information as a professional domain, the very quality that draws ambitious specialists toward it, makes it very hard to separate it from the work of general managers, financial managers or marketing managers. Being in charge of computers is one thing: what would it really mean to hold functional responsibility over all corporate information? Well into the 1990s, surveys run by CIO magazine suggested that spread of the CIO title had outstripped the reality. It concluded that CIOs remained “their own worst enemies” – more likely to be “self-deluded outsiders” than “in-touch agents of change.” Few CIOs reported directly to the President or CEO, few had political clout within the organization, most arrived in their firms as outsiders and remained that way. IT costs spiraled, and the average tenure of a CIO was measured in months. Though a 1986 Business Week article had been titled “Management’s Newest Star”, by 1990 the follow-up piece was headed ““CIO is starting to stand for 'career is over'; once deemed indispensable, the chief information officer has become an endangered species.”

In fact neither title gave an accurate picture, and both themes have been sounded frequently up to the present day. Massive spending on IT left firms with no choice but to grant senior status to their CIOs, but neither have IT executives ever received the broad authority over “information” itself that their apologists eternally demand. Despite these major technical shifts, we see more continuities: the need to establish a top executive position based on expertise in the techniques and technologies of efficient administration, the difficulty in doing so, a willingness to purchase new technologies that outstripped a willingness to heel to expert authority.

Through this process, information was thus becoming a vaguer concept than ever. Whereas MIS was, originally, a system to inform managers of what they needed to know, information was now a resource to be stockpiled and husbanded. It could be processed, consumed and even produced by machines. Indeed, by a strange reversal, we approach the modern situation where something effectively becomes “information” because it was stored using “information technology”.

Conclusions

Let me offer five observations in conclusion.

One: It seems that information is a powerful enough concept to sell vast quantities of hardware and software, just as talk of “facts” and “systems” sold file cards and office machines earlier. However, firms have been reluctant to fundamentally reorganize themselves around these technologies, as demanded by office managers, MIS enthusiasts and the CIO movement. The value of these technologies has therefore often been symbolic rather than economic.

Two: This points toward the continuing gulf between “technical” expertise and “managerial” expertise – categories that “information” as an area of professional expertise promised to blur. Both categories are, of course, socially constructed and have moved over time (consider the ascent of the CFO). Viewed as a tool for granting managerial status to the application of computers and other administrative technologies, information has enjoyed only a qualified success. The spread of information as a concept rests on its ability to absorb contradictions and bridge technical and managerial discourse – however this bridge is something of an illusion, and crumbles when people try to walk over it. In recent years, its close association with computers has even begun to shake the popularity of “information” expertise as a claim to true managerial relevance – hence to rise of “knowledge management” and the “chief knowledge officer”.

Three: As we saw with so many of the promotions made during the .com era, the idea that better information will spell an end to organizational politics is a delusion. (This is well-documented, see the work of Henry Mintzberg, Robert Thomas or Shoshona Zuboff on this score). Facts do not speak for themselves, and as any postmodernist knows, knowledge is never value-free. Yet firms continue to commit vast sums to new information-based technical fixes, such as data warehouse, ERP, and CRM projects, in the faith that large stockpiles of information will, by osmosis, improve corporate performance. Information may be the quintessential technical fix.

Four: These technical fixes functioned as the focal points of new communities, spanning both organizational boundaries and existing occupational loyalties. In this sense they have also been technocratic fixes. These new groupings brought the engineering and marketing staff of the fix-producing firms together with specialists within the firms using them – specialists whose

loyalties and skills were more closely tied to these technologies than to the employers for whom they worked, or even the industries in which they were employed. Consultants often played key roles in promoting and installing these fixes, as did the faculty of business schools. This is true on the micro-level of individual projects, and on the macro-level in which these ideas were promoted within managerial discourse. To understand the history of information and its related ideas, we must understand the communities and cultures from which they sprang and the interests that they served.

Five: Information, as we think of it today, and computer technology are inseparable. People generally say the first, when they mean the second. For a long time, at least, information was not tainted by the failure of most actual computer systems to deliver promised benefits. Information remained exciting and managerial, if amorphous, where computer hardware had lost much of its managerial glamour by the 1960s. Yet information, in its crucial modern senses, was created by information technology rather than vice versa. In other words, only the creation of information technology as a universal fix created information as a universal problem.