User friendly; the complexity of systems

- Be obvious -

And all the rules boil down to one thing: Be obvious. A machine should be designed so that customers can look at it, understand it, and figure out how to use it—quickly. Forget manuals. Industrial designers and manufacturers have discovered that there is an inverse ratio between the reading needed to learn how to operate a product and the use of that product.

Personal Workstations or Hobbled PCs?

Are PCs getting too big, powerful, and complex?

Surprising Complexity

Or is the PC industry thinking too small about ways new technology can empower users?

Usability Should Really Mean Never Having to Say You’re Sorry
'I CAN’T WORK THIS THING!'

FRUSTRATED BY HIGH TECH? DESIGNERS ARE GETTING THE MESSAGE

"Kenneth Olsen, the engineer who founded and still runs Digital Equipment Corp., confessed at the annual meeting that he can’t figure out how to heat a cup of coffee in the company’s microwave oven."

—The Design of Everyday Things
Donald A. Norman (Doubleday, 1988)

Every day, across America, millions of managers, bankers, doctors, teachers, chief executives, and otherwise highly competent men and women are driven to helpless frustration by the products around them. In their offices, once-familiar telephones and copiers have suddenly turned silent saboteurs, while new systems that were supposed to make work more efficient—computers, faxes, electronic mail—often do just the reverse.

En route from the office, their car dashboards have a dizzying array of digital displays and their radios sport a dozen tiny buttons too small to operate. Once home, it gets worse. Stress levels soar with VCRs, CD's, message machines, electronic thermostats, keypad burglar alarms, digital clocks, microwaves, more programmable phones, and home computers. People can’t seem to get things to work right anymore. Their lives have become a nightmarish world of blinks and beeps.

Enough!

The great revolution in electronic products that promised so much—speed, efficiency, and, yes, fun—is not delivering. Office productivity isn’t going up. Listening to music has been replaced by “programming.” And VCRs? They’re so painful to use that there are jokes about them: How do you know if a family has a teenager living at home? The clock on the VCR isn’t flashing.

Human engineering—or the lack of it—has always been a problem in some products, of course. But there’s a reason why it bedevils us much more now than ever before: the microchip. Modern electronics has turned the economics of design on its head. No more does the cost of adding features limit the number of capabilities a designer can put into a machine. The chip that was designed to perform a single basic function can frequently be made to do 2, 3, 4, or 50 operations at negligible cost—so why not pile on the features? Trouble is, too many companies wind up selling complex, overloaded gadgets that consumers can’t figure out. Impenetrable manuals don’t help much, either.
FOLLOW THE RULES. At one time, the electronics market worshiped products with these kinds of bells and whistles. Complexity was equated with high-tech sophistication. The reality, however, is that "complexity is actually a sign of technological immaturity," says Daniel T. Ling, IBM's manager of human factors. Simplicity of use is the true mark of any well-designed product, whether it's a bank cash machine or a Patriot missile.

Designers who have contemplated the dilemma of high-tech overload say that just a few design principles can make the difference between a product that intimidates and one that is not just accessible, but enjoyable. Follow the rules, and the products become comprehensible, manageable, and likely to succeed. Break them, and the machines will drive people away, taking sales with them.

And all the rules boil down to one thing: Be obvious. A machine should be designed so that customers can look at it, understand it, and figure out how to use it—quickly. Forget manuals. Industrial designers and manufacturers have discovered that there is an inverse ratio between the reading needed to learn how to operate a product and the use of that product.

One way to make a product obvious is to clarify its functions and provide feedback that guides the user through all the operations. A dialogue between machine and user is established so that users can see what they are actually doing.

Xerox

Without feedback, even a superb machine can fail in the marketplace. Back in 1980, the market rejected Xerox Corp.'s 8200 office copier. It was the first time in Xerox' history that people had balked at the company's copiers, and no one knew why. Technologically, the product was impressive. It was the most advanced machine available, packed with lots of on-board computer intelligence. And it worked perfectly in the lab.

HUMAN FACTOR. The problem was that the engineers had piled so many complex features onto the copier that casual users, who in the past had been able to operate Xerox machines easily, could not make it work. "Xerox' strategy at that time was to grow by expanding the use of collating, enlarging, reducing, and other fancy features," says Arnold S. Wasserman. Wasserman led the Industrial Design/Human Factors Design Center at Xerox' Palo Alto Research Center (PARC) between 1980 and 1986, then became vice-president for corporate industrial design at Unisys Corp., and was this month made dean of art and design at New York's Pratt Institute. "The only problem was that no one paid attention to the human interface—to the user," he recalls. "People had to wade through buttons and visual noise and manuals for all features, including the most frequently used one, copying a page or two." Old customers abandoned Xerox for simpler Japanese machines, and Xerox' share of the U.S. copier market plummeted.

JUST 15 MINUTES MORE AND I'LL BE DONE' SET THE CLOCK ON THIS FIRST-GENERATION VCR BY Hitting 'SET' AND 'SELECT' BUTTONS EIGHT TIMES. TUNE IN EACH STATION BY ROTATING TINY SELECTOR BUTTONS UNTIL EVERY CHANNEL IS CLEAR TO PROGRAM, HIT 'ON/OFF,' 'SELECT,' AND 'SET' BUTTONS 14 TIMES

68 BUSINESS WEEK/APRIL 29, 1991 PHOTOGRAPHS BY TED MORRISON

"EVEN I CAN DO IT!' MENUS ON THE TV SCREEN OF THIS NEW SVE UNIT WALK YOU THROUGH RECORDING AND PROGRAMMING. A FOUR-STEP CHOICE IS MADE BY PRESSING 'SELECT,' 'SET,' AND 'TIMER' BUTTONS ON THE REMOTE. ALL STATIONS COME PRETUNED, BUT SETTING THE 1# 11% CLOCK IS STILL A PAIN
Trends

BRIEFS

Apple to the Core:
Apple plans to deliver a family of Macintosh computers this fall aimed at home users. Selling in department stores for between $1,000 and $2,000, the consumer Macs will come with software installed and "work like hair dryers; you turn them on and they work," says Bob Puente, president of Apple USA. Personal digital assistants, such as a wallet-sized CD reader with an LCD panel, are due next year.

COMPUTERS SO FRIENDLY, YOU FORGET THEY'RE THERE

I was delighted to read "It's a PC, it's a TV—it's multimedia" (Special Report, Oct. 9). In our age of information overload, the computer's ability to select and present information will prove to be an important strategic tool. For the past five years, Cognetics Corp. has been working with the Human-Computer Interaction Laboratories at the University of Maryland to develop Hyperties—a technology for creating and presenting "interactive books" on PCs.

The lesson we've learned is that technology, exciting as it may be, is the easy part. The challenge is to create a software environment so intuitive and easy to use that the technology disappears and does not interpose itself between the user and the content.

The computer as a medium of communication must be as simple to use as a book or a television. Our experience is that users who can zoom effortlessly through information feel empowered; those hampered by poor software design feel diminished. Given the razzle-dazzle of interactive multimedia, it's a lesson too easy to forget.

Charles B. Kreitzberg
President
Cognetics Corp.
Princeton Junction, N.J.

Business Week 7br6, 1989

The house-trained PC

LOS ANGELES

IS THE computer age really coming to America? On April 6th Apple Computer said it will sell its computers at Sears Roebuck, America's biggest department store, which already sells machines made by IBM and Compaq. Apple pioneered the use of screen symbols to make computers less intimidating. Now it promises a range of simple "plug in and play" computers that technophobes can operate without knowledge of initialising, formatting, booting and so forth. The computer, say Apple and its rivals, is about to become just one more household appliance, like a television or washing machine.

Well, maybe. Then again, maybe not yet. Though nearly every business in America has a computer of some sort, only a fifth of its homes do. For all the talk of computers being just another consumer gizmo, Americans still do not seem to trust them: hence the many computer "help centres" for confused or wary business customers.

Nevertheless, big retailers like Sears, Wal-Mart and Macy's have tried to flog computers like any other household item, which has started a cut-throat price war already sweeping the personal-computer market. Two other fast-growing distribution channels are computer superstores and mail-order companies like Dell and Gateway. Big computer companies, which once scorned such outlets, now have no choice but to sell their own computers through them.

Lower prices have made computers more affordable. But Douglas Kass, an analyst at Dataquest, argues that, so far, most claims about computers' ease of use are little more than marketing hype. Until computers are accompanied by two-page user-manuals like video-recorders (and perhaps also by the small child needed to understand the two pages), they will not become a fixture in every American living room.

The Economist

Apr 11, 1992
Usability Should Really Mean Never Having to Say You’re Sorry

On the contrary, graphical environments offer many more degrees of freedom in design and considerably more temptation to exercise that freedom. Style guides for software developers are responsible for the consistency within Windows and Macintosh environments.

Early competition among applications was based principally on features. Who’s got an integrated outlining tool? Document revision marking? Style sheets? With major software applications approaching feature parity, however, there’s new pressure on the user interface. Now, the interface is being used as a basis for product or even product-line differentiation, rather than as a path to usability.

Icons are a particularly abused class today. Every major software developer has taken a different approach—from the highly structured and relatively inflexible Microsoft toolbar to the infinitely flexible and configurable Lotus “smart icons.” Users tend to brand themselves stupid if they can’t instantly figure out what all those little pictures mean. But make no mistake: The only thing that’s smart about these icons is that you need an IQ of 180 to keep them all straight.

Interestingly, some software designers will tell you that complexity in their designs is a sign of respect for the user. Advanced users, they feel, are up to the challenge of finding the subtleties of their software—just as some people are delighted spending a Saturday evening with a 1,500-piece jigsaw puzzle. Most of the usability work being done in software companies today is rightly directed at novice users.

This kind of trade-off between complexity and usability, though, is like saying a fast car should be harder to drive. In fact, it merely demands more of the design engineers.

There are entirely too many sheepish confessions by PC users today. We are all too ready to blame ourselves when we forget where a common function is on the menu tree or when we make the same mistake twice. It’s part of the same instinct that deflates us when we push on door handles we’re supposed to pull or turn on the convection oven instead of the microwave. But the more we talk to others about our experiences, the more we hear David Letterman joke about programming VCRs, the more we realize that the problem lies in the basic design of the products we use.

Software usability is a major issue for the industry in this decade—one that major players are just waking up to. Next month, I’ll show you some of the ways in which it’s being done right . . . and ways to see if the software you’re thinking of buying really measures up. When you hit a usability barrier in software, you should never say “I’m sorry.”
When Things Don’t Work

Jerry Pournelle seems to be encouraging a certain impatience with recalcitrant software. His attitude seems to be that if a program doesn’t do his instant bidding, he’ll stuff it into the nearest waste can. Software should, of course, be as user-friendly as human ingenuity can make it. Life is too short to spend a lot of time thrashing around helplessly with some perverse command structure.

On the other hand, approaching software with a chip on your shoulder can be distinctly counterproductive. I speak not only of mainstream user programs, but also of operating systems and compilers. Jerry’s battles with Unix and C are premier examples. He dutifully installed Unix on one of his 386s, and when he couldn’t get it to run satisfactorily in two weeks, he consigned it to limbo because it was “unfriendly.”

Neither Unix nor C is for the faint of heart or the prematurely geriatric. This is software that requires a lifetime commitment. Expect to work hard for several months before you gain even minimal control over a system and a language as powerful as Unix. Once you have made this initial investment of energy, the rewards are big-time.

William B. Fankboner
La Quina, CA

My attitude is that if I have to work too hard at software, what it does had better be worth the work. If it doesn’t accomplish much, why should I spend a great deal of time learning it?

Some software is obviously important, and one simply takes the trouble to learn it. But often there is another program as good as the complicated one and much easier to learn. And I certainly decline to make a lifetime study of an operating system.—Jerry Pournelle

Simpler IS MORE COMPLICATED

DO YOU REMEMBER the term user friendly? There was a time when it appeared every day in at least one headline of virtually every computer magazine. Now, it’s as hard to find as a clear day in Seattle. But the term hasn’t gone away because user-friendly software is so commonplace that no one need mention the concept anymore. It has gone away because the vision of making software interfaces simpler is receding even further, and it’s embarrassing to discuss the trend.

The problem is that software developers are trying to create simpler interfaces for increasingly complex systems. It all started with an attack on DOS. Computer savants, who viewed the DOS prompt as impersonal and unhelpful, moved the computer community to icons, believing that people understand pictures better than they understand words. I’m not certain that linguist Noam Chomsky would agree, but the idea has caught on. Spurred on by the popularity of the Macintosh, the PC world has embraced the move to graphical user interfaces (GUIs), and programs such as Windows and Presentation Manager have emerged.

The convoluted thinking here is that GUIs make computing easier by letting us simultaneously display more information on screen. Now, in place of a simple prompt, we face a multitude of windows, 10 pull-down menus, many more submenus—each with 12 options—and eight multitasking applications (two of which run in the background, periodically delivering status messages, while E-mail alerts flash on the screen). The congestion has reached such proportions that some graphical interfaces now include utilities to clean up window clutter. Is this friendliness or just madness?

Unfortunately, the problem with GUIs goes deeper than visual overload. Along the evolutionary road from assembly language to high-level languages, menus, and graphical interfaces, another level of complexity was introduced. You see, although it is possible to get work done in a windowing environment once it is established, it’s difficult to set up an array of applications that work comfortably within that environment.

The fact is, “simpler” graphical interfaces are more complex than the stark DOS interface they’ve replaced, presenting situations in which even Ctrl-Alt-Del won’t help you. Perhaps software developers should reconsider the real meaning of user friendly. Maybe after they do, simpler will really mean simpler.

Paul Nesslove

[But I think GUIs will help]
Why Do Things Become More Complex?

Fifty years ago our technologies, our organizations and our lives were less complicated than today. Things were simpler. Most of us prize this plainness, this simplicity. Yet we are fascinated by complexity. Lately I've been wondering why the simple becomes complex. Is there a general principle causing things to get more complicated as time passes? Is complexity useful?

One good place to look for answers to these questions is the history of technology. The original turbojet engine, designed by Frank Whittle in the early 1930s, was beautifully simple. The idea was to propel aircraft by a jet of high-speed air. To do this, the engine took in air, pumped it up by a compressor and ignited fuel in it. It passed the exploding mixture through a turbine to drive the compressor, releasing it through an exhaust nozzle at high speed to provide thrust. The original prototype worked well with just one moving part, the compressor-turbine combination.

Yet over the years, jet engines steadily became more complicated. Why? Commercial and military interests exert constant pressure to overcome limits imposed by extreme stresses and temperatures and to handle exceptional situations. Sometimes these improvements are achieved by using better materials, more often by adding a subsystem. And so, over time, jet designers achieve higher air pressures by using not one but an assembly of many compressors. They increase efficiency by a guide-vane control system that admits more air at higher altitudes and velocities and prevents engine stalling. They increase combustion temperatures, then cool the white-hot turbine blades by a system that circulates air inside them. They add bleed-valve systems, afterburner assemblies, fire-detection systems, fuel-control systems, deicing assemblies.

But all these bring with them maintenance, repairs, appointments, obligations—a thousand subactivities to keep them going. In this case again, the overall result is increased complexity of debatable effectiveness.

In answer to the original question, I believe there is a general law: complexity tends to increase as functions and modifications are added to a system to break through limitations, handle exceptional circumstances or adapt to a world itself more complex. This applies, if you think about it, not just to technologies and biological organisms but also to legal systems, tax codes, scientific theories, even successive releases of software programs. Where forces exist to weed out useless functions, increasing complexity delivers a smooth, efficient machine. Where they do not, it merely encumbers.

But, interestingly, even when a system gets lumbered down with complications, there is hope. Sooner or later a new simplifying conception is discovered that cuts at the root idea behind the old system and replaces it. Copernicus's dazzlingly simple astronomical system, based on a heliocentric universe, replaced the hopelessly complicated Ptolemaic system. Whittle's jet engine, ironically, replaced the incurably complicated piston aeroengine of the 1930s before it also became complex. And so growing complexity is often followed by renewed simplicity in a slow back-and-forth dance, with complication usually gaining a net edge over time.

The writer Peter Matthiessen once said, "The secret of well-being is simplicity." True. Yet the secret of evolution is the continual emergence of complexity. Simplicity brings a spareness, a grit; it cuts the fat. Yet complexity makes organisms like us possible in the first place. Complexity is indeed a marvel when it evolves naturally and delivers powerful performance. But when we seek it as an end or allow it to go unchecked, it merely hampers. It is then that we need to discover the new modes, the bold strokes, that bring fresh simplicity to our organizations, our technology, our government, our lives.

W. BRIAN ARTHUR is Morrison Professor of Economics at Stanford and external professor at the Santa Fe Institute, where he investigates the economy as an evolving, complex system.
Kind Word for Low Tech

A RETIRED car dealer from Surfside, S.C., has invented "The Great Mouth," a trash bag that will actually stay open while being stuffed — can you believe it?

Editorial pages generally deal with big-ticket items of scientific breakthroughs like supercolliders, space stations. But among inventions, as elsewhere, little things count, like a trash bag that leaves both hands free to fill it.

For more than a decade, the standard grumble has been, "If we can put a man on the moon, why can't we...?" That may be the right question, but all too often, the response has been high-tech. To achieve the perfect shave, for instance, an electric shaver has been invented that self-adjusts to 576 cutting patterns.

One complex invention inevitably inspires a second invention to contain it. Thus microwave ovens have produced microwave-leakage testers, which will no doubt lead to another gadget to test if the testers are working.

Mainstream inventions - refrigerators, television sets, automobile engines - operate more reliably than ever. When did you last have to repair a radio?

On the other hand, has anyone calculated the cost of repairing devices like electric windows and power antennas on automobiles, those complicated extras that are always the first things to break down? And how about the time consumed in maintaining all the delicate little push-button apparatuses that are intended to save time? If, in the name of simplicity, one chooses to travel by bicycle, what does it say about progress that one must face the complexity of some 24 gears?

In the world of over-ingenious invention, as in the corporate world, there is a plausible argument for attending with a little low-tech cleverness to the modest needs of daily life.

If we can put a man on the moon, why can't we invent a spot remover that really works or suction-cup attachments that really hold? For all the fleas-and-tick fighters, including ultrasound bombardment, is there a simple, safe remedy your dog or cat can count on?

As the saying goes, it doesn't take a rocket scientist to invent a "Great Mouth" trash bag; just a reusable cardboard insert does the trick. However, in the Brave New World where intelligent people have trouble programming a VCR, the old rule is not yet obsolete: Build a better low-tech invention and a lot of grateful people will beat a path to your door.

She Monitor

Jun 21, 1993
If It Ain’t Broke, Don’t Break It

My 1963 Dodge Dart convertible has three heater controls. They’re big round knobs. They’re easy to find, and I can tell them apart even in the dark. Nearly 30 years of technological progress brought us the 1990 Buick, which uses 14 buttons to accomplish essentially the same functions. The 14 buttons are all exactly the same size and shape, and they’re all perfectly flat, so as to be indistinguishable by touch. It seems to me that any control in a car that requires that I look at it is inherently wrong.

Unfortunately, these kinds of mistakes seem to be the rule rather than the exception. I test drive 50 to 100 new cars a year, and I am struck by the incredible proliferation of blatant ergonomic errors. I’ve been pondering this situation and I suggest the following taxonomy of blunders that designers succumb to:

1. Using a technology not because it’s appropriate but “because it is there” (the Sir Edmund Hillary School of Ergonomics).
2. Being different at any cost.
3. Reinventing whenever possible.
4. Copying nothing, not even good ideas: it’s embarrassing to admit that you didn’t think of them yourself.
5. Just plain stupidity (otherwise known as the Ted Williams Theory; he once advised a not-too-bright teammate: “If you don’t think too good, then don’t think too much”).
6. Too many cooks.
7. Oops! Where are we going to put this?

Consider these examples. A couple of years ago, I climbed into a mid-size American sedan with power everything. The seat controls were in the traditional location on the left side of the driver’s seat. But when I reached down to adjust the seat, my hand did not fit between the door and the side of the seat—1 had to open the door to adjust the seat! This was a category 6 mistake—too many cooks: the designers of the inside door panel evidently didn’t talk to the group designing the seat controls. No big deal, I thought—they’ll fix it next year.

And fix it they did. Sort of. The following year, the power seat controls consist of nine identical flat buttons, a category 3—reinvent everything—error.

But where to put those nine buttons? Well, the car has a console between the bucket seats and they put the buttons on a vertical plate at the back end of this console, toward the rear of the car (category 7—where the hell...). Are these controls awkward to reach? Try touching the back of the chair you’re sitting in with your fingers.

It gets better. Which button to press? To see the hieroglyphics printed on the buttons, I must not only take my eyes off the road, but I must look toward the back of the car. This clearly qualifies as a category 5 (just plain stupid) and a category 2 (be different).

This seat-control debacle is especially sad considering that about 10 years ago, Mercedes Benz designed the ultimate in power seat controls; it will surely go into the Ergonomic Hall of Fame for beauty, simplicity, and pure elegance. “If you want to control a seat,” the Mercedes designers must have said, “why not make a control that’s shaped like a seat!”


(Despite Mercedes’ brilliance with the seat controls, even they are not immune to plain stupidity. The $70,000 300SE that I recently tested has a heater control with a 1-by-1/4-inch LED temperature readout in the center of the dashboard. We’re supposed to read these tiny numbers while driving. Not only that, but the adjustment knob is so sensitive that I can barely “control” the temperature within 10 degrees as the vehicle is moving.)

Just how far can designers take their obsession with indistinguishable buttons? The answer comes from GM. “Why not,” they must have mused, “put the controls for everything on a touch-sensitive screen.” This touch screen takes the multibutton philosophy to a totally new level of stupidity. It can display thousands of buttons with no discernible edges at all. Can you feel a pixel? GM used touch-screen technology not because it made sense but because it was there.

When it comes to ergonomics, is technology replacing common sense?

Another part of the car that is rife with technology run amok is the radio. Ironically, the best ergonomically designed radios are available from GM—but only if you buy the cheapest one. More money gets you technologically overkill, like a graphic equalizer that displays the sound frequency spectrum so you can fiddle endlessly with the controls and watch the lights to get exactly the tone you want. A graphic equalizer? In a car? Now really. In my wife’s Volvo, the radio has six buttons in a space about equal to the surface area of your fingertip. Since these buttons all do something wonderful, the designers must have reasoned, why

Illustations: Jack Desrocher
Personal Workstations or Hobbled PCs?

Are PCs getting too big, powerful, and complex?

Or is the PC industry thinking too small about ways new technology can empower users?

Richard Landry

Is the next generation of personal computers too muscle-bound for the average user's own good? It all depends, Steve Jobs might say. Lately, Jobs has been going around selling the notion of "personal workstations"—PCs far more powerful than today's standard fare, but geared toward personal productivity rather than raw throughput.

Traditional workstations stress speed over simplicity, Jobs says—that's why they come with an army of technical personnel. PCs are simpler to set up and use but lack the steam to run software smart enough to make difficult tasks easy. That's why PC training and support is a crushing burden to most businesses. Personal workstations, by contrast, combine the best of both worlds—power that delivers greater ease of use with flexible networking that encourages work groups to share information. The result is lower support costs and higher productivity, a promise even Jobs can't help making sound too good to be true.

The New PCs: Workstations or Servers? Still, Jobs and his Next system represent only one side of an industry-wide debate about how best to use the growing power of high-end PC systems. On the other side sit a substantial number of vendors and MIS professionals who see a golden opportunity to shift the momentum of office computing away from mainframes and mini-computers, toward local area networks linked at their hubs by powerful PC servers. (See the preview "A Miniature Mainframe for PC Networks" in this issue.)

This vision plays down the PC's role as personal productivity tool in favor of its place as gateway to a company's information system. The benefits are compelling: lower hardware costs, easy expandability throughout the system, and a modular design that fits the decentralized nature of contemporary business. The price: a surprising complexity that threatens to rob users of the freedom to control their own computing environments.

At a recent Businessland conference entitled "Managing Your Microcomputer Portfolio in the 1990s: A Challenge in Complexity," MIS professionals wondered out loud how far they could go in pursuing the latter agenda without incurring the wrath of users and driving training and support costs through the roof. While acknowledging that today's decentralized businesses need decentralized corporate data, none expressed any confidence that they could teach users to successfully navigate distributed data bases or that they could protect the data itself from becoming riddled with errors.

Concerns like these quickly complicate everyday computing. When users want to draw data from multiple distributed servers, will they have to negotiate differences in server software? Will off-the-shelf software handle these subtleties, or will huge training and programming efforts be required? What happens to users' investment in homegrown dBASE or Paradox files? In short, how many restrictions will we have to live with just to get at vital company data?

Wanted: Personal Workstations Users concerned with harnessing PC power to get work done need these problems like a hole in the head. Luckily, some vendors see opportunities in the headaches distributed servers can cause. PC data

(continues)
Lofty ideas don’t build systems

FRANCIS K. WALNUT

A college education is supposed to make us more knowledgeable, not less, but that doesn’t seem to be how things have worked in software development. The way this subject is taught at most colleges and universities is actually eroding the quality of systems produced.

Despite miraculous advances in hardware efficiency, software systems development is less efficient now than it was 30 years ago. Reliable software systems can be produced more efficiently by a programmer with a computer in his basement than by a professionally managed IS organization.

Most software experts come from three educational disciplines: engineering, information science and computer science.

The engineering discipline dictates that software engineers spend most of their time preparing detailed plans that define every aspect of the development process. Students are taught that when these specifications are completed, their job is over and they should let someone else do the implementation.

Implicit in software engineering education is the idea that specifications are the only legitimately creative part of software development and no one should be involved personally, let alone emotionally, with a software project from conception through maintenance.

The fact is, however, that software system implementation is the most critical part of any software development project. The way it is handled and the quality of the people who handle it almost always mean the difference between system acceptance and system disaster.

Even more than the software engineers, management information graduates denigrate the place of the software implementor. Information management studies concentrate on "big-picture" analysis and treat implementation as an unfortunate necessity.

The computer science curriculum approaches software development as if it were a natural science, using the scientific method to seek basic principles and fundamental truths. In the eyes of this group, no one who implements software without employing the same rigorous scientific methods can possibly be doing an efficient job.

All talk, no delivery

Because it is considered good corporate policy to get the leaders of tomorrow from the academic world, the software community is becoming increasingly populated by sophisticates who can merely write specifications, talk about the "big picture" and deliver impressive speeches.

At best, the graduates of these courses of study patronize the efforts of the people who code, test and maintain software systems. At worst, these newly minted graduates actively malign the programmers' approach to software development and express the opinion that anyone who writes innovative and creative code should be fired.

Unless we rediscover the value of the experienced, end-toc end programmer, we will soon arrive at a point where all our software experts will be able to plan and discuss projects but will be totally incapable of making them work.

On second thought, maybe we're at that point already.

Walnut is a software documentation consultant and a programmer with a computer in his basement.

The mail-order CPU upgrade from hell

ALAN RADDING

The direct-mail PC discounters have taken a lot of heat in the press in recent months for poor quality and poor service. Unfortunately, I now understand what everyone has been talking about.

I purchased an mail-order drive required different cables, but this was not mentioned and they were not included. Add another call to tech support.

- Fix the problem, don’t just replace parts. There was a real problem to be addressed, but tech support’s initial responses were to send replacement parts. (Federal Express made more money than the vendor on this deal.)

- Send the documentation. Those boring, ugly little booklets that accompany things like drive controllers and motherboards actually contain some helpful information. Because the documentation wasn’t included, add three more calls to tech support for setting switches on the motherboard and placing jumpers on the drive controller.

None of the replacement parts worked any better than the ones they replaced because the underlying problem — a short apparently caused by the way the motherboard sat in the case — kept interfering.

It was almost by accident that tech support and I finally discovered...
Why is it that people who can make wonderfully complicated products can’t explain in clear, simple English how to use the darned things?

A frustrated consumer

April 1993

BY THOMAS SOWELL

Dr. Thomas Sowell is an economist and a senior fellow at the Hoover Institution in Stanford, Calif.

Dear Sir:

I have just had the misfortune of buying one of your printers to use with my computer.

Since it is a top-of-the-line printer from a very reputable company, you may wonder why I consider it a misfortune to have bought it. The answer is quite simple: I bought it so that I could print things. Yet it was 24 hours after I brought it home before it printed anything, and now—at after 48 hours—it has yet to print anything satisfactorily.

The reason it printed nothing at all during the first 24 hours was that the necessary computer codes were supplied by you on 5.25” disks, while my computer is one of a growing number with slots that are only 3.5” wide. People in a high-tech company like yours are undoubtedly well aware that you were supplying an obsolescent disk—and that virtually all computers will accept the smaller size.

That should have been the tip-off on your attitude toward the consumer.

Yes, you included a postcard that could be mailed in to get the kind of disk that virtually all computers take, instead of the kind that is on its way out. But do automobile manufacturers sell cars with little cards that you can mail back to Detroit (or Tokyo) to get tires that fit?

When a consumer arrives back home with a newly purchased product, after having shelled out a fair amount of his hard-earned cash, he wants to be able to start using the product, not facing a series of frustrations.

With far less trouble than it took to include that postcard in your instruction book, you could have told us how to transfer the computerized information from the big floppy disk to the little disk. My assistant, whose native language is not English, was able to explain it to me in a very brief note, so that I could make the transfer on another computer.

Now that the material on your big disks was on smaller disks that I could actually use, I was optimistic enough to think that it would be a simple matter of inserting the disks into the computer and transferring the information necessary to get the printer printing. No such luck.

First, I had to struggle with your “instructions.” The word is in quotation marks because it is hard to imagine anyone actually being instructed by the rambling words that regaled us with the wonders of your product—all of which I had to take on faith, because it hadn’t actually printed anything yet.

Advertising is of course part of the commercial process, and part of the American way of life. But someone should have figured out that by the time the consumer had opened up the box that the printer came in, unpacked all the material inside, and torn open the little plastic bag containing the books of instruction, he had already bought the product.

What I needed was not persuasive puffery but straight information on how to start the thing printing.

You know and I know that what it all boils down to in the end is touching certain keys on the computer keyboard to get the information transferred from the disks into the computer. Yet your “instructions” did not begin by telling me in plain English what those keys were, and in what sequence they should be touched.

Instead, these “instructions” informed me about bauds and networks and other wondrous possibilities. And somewhere, buried in the midst of all this, were a few inconspicuous computer codes which I ventured to believe might be what I was looking for. But it was by no means certain.

Don’t get me wrong. I am not against information, or even sophisticated information. But just as we eat meat and potatoes before we get dessert, so we could use some clear information on the necessary basics before we go off into the wild blue yonder about special features and special jargon that everyone does not need or understand.

While I am not a computer aficionado, I do know something about reading and writing. I have not only read more books than I care to remember, I have even written more books than I care to remember.

It is understandable that computer wonks would write instructions for other computer wonks. But why not provide another set of instructions for the rest of us? We have equal rights under the Fourteenth Amendment and those who are religious say that we are equal in the sight of God.

Perhaps more to the point, from a commercial perspective, our money is just as green as anybody else’s.

This letter, incidentally, is printed on a much less expensive printer than yours, less renowned, and with fewer features. But it prints fine. At this point, I still haven’t been able to get yours to do that.

Yours disappointedly,

Thomas Sowell
Do more.

System 7 for Macintosh

If it weren't for all the work, we'd all get a lot more accomplished.

It isn't a shortage of thinking, inspiration or motivation that prevents people from achieving their goals.

It's the abundance of organizing and coordinating, processing and procedure, training, retraining, searching and shuffling that they have to do along the way.

Personal computers were supposed to streamline the mundane chores and monotonous routines so that we could concentrate on solving problems and moving ahead. What happened?

The April 29th Business Week cover story about product design put it quite bluntly: "Every day, across America millions of . . . highly competent men and women are driven to helpless frustration by the products around them . . . New systems that were supposed to make work more efficient . . . often do just the reverse."

At Apple, we couldn't agree more. We believe most PCs are too hard to set up. Too difficult to use. And too expensive to support.

That's why we make the Apple Macintosh personal computer.

It's the one personal computer that was designed from the very first chip to work the way that people work.

A computer that has been consistently rated significantly higher for user productivity than other PCs, including computers running Windows 3.0.

The only computer to be named one of the best designed products of the last decade by Time magazine.

Every Macintosh has powerful built-in networking capabilities. (The only family of computers to do so.) Because people get more accomplished when they work together than when they work alone.

And now, with the introduction of the latest Macintosh system software — a breakthrough known simply as System 7 — a Macintosh will do even more for you. With new powers designed to turn a

network into less work and a company into more of a team.

System 7 also simplifies and refines the way that a Macintosh works. To make the computer that's famous for being easy to use even easier.

If you would like to see just how hard a personal computer can work, see the family of affordable Macintosh computers today at your authorized Apple reseller (call 800-538-9696, ext. 777, for the location of the one near you).

And get your hands on the power you buy a personal computer for in the first place. The power to be your best!
How to install a printer.

The hard way:
1. In Program Manager, double-click on the Main group.
2. Open Control Panel.
3. Choose Printers.
4. Click on the Use Print Manager checkbox.
5. Open File Manager and find the PRINTERS/WIN file.
6. Find the information on your printer for setting up driver switches, configuring memory, etc.
7. Connect the printer to port LPT1.
8. If necessary, set the driver switches and memory configuration.
9. Return to Control Panel.
10. Click on the "Add" button.
11. Select your printer from the list.
12. Click on "Install.
13. Find your Windows 95 printer.
14. If prompted for other files, insert the appropriate diskette.
15. Click on the "Close" button.

The easy way:
1. If necessary, drag the printer driver icon to the Macintosh System Folder.
2. Connect the printer to the printer port.
3. Open Chooser.
4. Click on the printer icon that matches your printer.

How to retrieve a deleted file.

The hard way:
1. Purchase a utility program, such as Norton Desktop for Windows on your computer.
2. Restart the computer.
4. Double-click on the Norton Desktop Applications group.
5. Double-click on the SmartErase icon.
6. Find the directory where your file existed before you deleted it.
7. Click on the directory where your file existed.
8. Select the deleted file from the drive window.
9. Click on the "UnErase" button.

The easy way:
1. Double-click on the trash can.
2. Drag the deleted file out of the trash can.

How to play a sound.

The hard way:
1. Purchase a sound board.
2. Open the computer case.
3. Install the speaker cable on the board.
4. Set the DMA and IRQ jumpers on the board.
5. Install the board.
6. Detach the internal speaker cable.
7. Attach the board's speaker cable to the internal speaker.
8. Close the computer case.
9. Install the software driver for the sound board.
10. Start the sound recorder program.
11. Select Open from the file menu.
12. Type the file name in the File Name box.
13. Choose OK.
14. Click on the Play button.

The easy way:
1. Double-click on the sound's icon.

How to rename a directory.

The hard way:
1. Double-click on the Main group in Program Manager.
2. Start File Manager.
3. Highlight the directory you want to rename.
4. Select "Rename" from the file menu.
5. Type in a new name for the directory (must be 8 characters or less).
6. Go to Program Manager.
7. For each application in the renamed directory, select "Properties" from the file menu.
8. For each application in that directory, change the command line to reflect the new path to the application program (for example, EXCEL.EXE or EXCEL.DOC).

The easy way:
1. Highlight the directory (folder) you want to rename.
2. Type a new name (up to 31 characters).

How to connect to a network.

The hard way:
1. Open the computer case.
2. Configure jumpers or DIP switches on the network interface board.
3. Install the network interface board.
4. Close the computer case.
5. Connect the network interface cable.
6. Install the network software (configure network parameters).
7. Start Windows.
8. Run Windows Setup to load drivers for installed network software.
9. Restart computer.

The easy way:
1. Plug in cable.
2. Open Chooser.
3. Select AppleTalk "Active" button.

How to add an external hard disk drive.

The hard way:
1. Open the computer case.
2. Configure jumpers and/or DIP switches on the interface card.
3. Install the card.
4. Attach the peripheral to the interface card.
5. Close the computer case.
6. If necessary, run the appropriate configuration program provided by the manufacturer.
7. Copy the peripheral driver file to the root directory.
8. Run the peripheral's installation program.
9. If not done by the installation program, modify DOS configuration files (AUTOEXEC.BAT and/or CONFIG.SYS).
10. Modify Windows configuration files (WINDIR and/or SYSTEM.INI).

The easy way:
1. Plug it into the Macintosh.
2. Start up the Macintosh.
They Just Don’t Get It

Any businessperson will tell you that personal computers are still too difficult to use. Why can’t people inside the industry see that?

Personal computers are just too hard to use, and it’s not the fault of the people who use them.

That was my opening thought in the very first Personal Technology column I wrote for the Wall Street Journal in October 1991. This conviction has helped make the feature one of the most popular that paper has ever run.

Why has a column that is strongly proconsumer and highly skeptical of the PC industry struck such a chord among readers of the bible of American business? Because millions of people are frustrated and disappointed with the PC. To get the much-touted benefits of personal computing, they have learned, requires far more time, effort, and money than they expected. Their disaffection is a signal that the PC industry is out of step with two big trends: the changing structure of the U.S. economy, and changing attitudes among computer users.

Big corporations are a declining source of jobs—and of desktops for PCs. The engine of growth in our economy now consists of small- and medium-size businesses, small professional firms, and even people working out of their homes. Unlike giant companies, these organizations can’t afford and often don’t want the large IS (information services) departments that support personal computers in the Fortune 500—the priests who care for and control PCs.

But IBM-compatible computers and software too often still seem mainly designed and marketed to please the corporate computer priesthood and consultants. These folks, in many cases, depend on the complexity of computers to justify their existence.

The basic configurations of these compatibles don’t include things like SCSI ports, networking, modems, and even decent video and sound. You can order all these at purchase time, of course, but only if you know in advance what to ask for. If you don’t, you’ll eventually learn that you can’t easily expand or configure the typical PC without opening the cover, inserting cards, and fiddling with switches and jumpers—often for hours—to resolve potential hardware conflicts that nobody should have to worry about.

Only Apple makes real plug-and-play computers today, although the Mac is still overpriced. But surely some IBM-compatible manufacturer can build a base-level “commodity” PC.

The industry’s lame response has been SOHO (small office/home office) machines—usually lower-power boxes bundled with dumbed-down software and maybe modems, but built on the same complicated architecture. The customer deserves more.

The software situation is better, mostly due to the advent of Windows, which has standardized user interfaces, printer and video drivers, communications, and fonts. But even here, there’s too much complexity. The corporate priests like checklists of features, so software publishers cram in scores of them, many buried deep in the program, where average users rarely find them. The priesthood runs training classes, so it thinks nothing of buying software that requires such classes.

If the basic structure of business is becoming less hospitable for hardware and software that require technical knowledge, a second shift will reinforce that trend. Computer users are becoming much less reverent of the PC, and they’re much more impatient about its complexity. People are tired of computer companies making them feel stupid or lazy or guilty. They’re smart and hardworking in their own businesses and simply don’t want to have to learn the PC business just to get productive use out of a business tool.

These trends show that we’re leaving the first great era of personal computing. It was a Model A sort of period in which you had to know what happened under the hood to get much driving done. We are finally entering the era of the PC as a real business tool, at least from the perspective of consumers. Companies that figure that out and capitalize on it will prove to be the big winners as the 1990s unfold.

Walter S. Mossberg writes the Personal Technology column in the Wall Street Journal. He has been a reporter for more than 20 years and has owned and worked with PCs since 1982. He can be reached on BIX c/o “editors,” at MCI Mail at WMOSSBERG, or on the Internet at wmosberg@mcmail.com.
My View

User Interface vs. GUI

Roy Jaffe

Power to the People

In the microcomputer industry in the 1980s, there was enormous growth, turmoil, shakeout, and ultimately success in penetrating and nearly saturating the corporate market. But with the exceptions of Tandy (a special case) and Apple (which has reoriented itself to the corporate marketplace), the companies that sparked mass-market computing—Commodore, Atari, Timex, Texas Instruments, and Sinclair—have all stumbled or fallen by the wayside.

There's no consensus as to who will lead or what the path will be to mass-market computing in the 1990s. For those companies, like Berkeley Softworks, whose primary goal is to make computing, in its broadest sense, a truly mass-market phenomenon, the second decade of microcomputing offers particular challenges. The paramount challenge: delivering ease of use and picking the right hardware platform.

The microcomputer is the most complex device ever to have entered a mass retailer's store. Its ability through software to become a game machine, productivity tool, telecommunications terminal, fax machine, command and control device, and so on holds enormous promise. Yet the blizzard of application products, often with hard-to-use interfaces, has intimidated many potential customers. Ease of use remains the largest barrier to mass-market success.

Ease of use is a relative concept. The Macintosh and Windows are easy to use compared to command line interfaces. But they're not easy for someone in a small business or home who has no access to training and just wants to use an electronic calendar/address book, write a memo, or send a fax. The solution isn't as simple as making everything easier. While a scripted, sequential interface that walks the user through each step might be easy for a naive user, it becomes tedious and frustrating as the user's skills and aspirations grow.

What we need to open up the mass market is a Scalable GUI (SGUI), a GUI that allows the same applications to be accessed at various user-selectable levels of functionality. These levels range from an appliance mode, where users are only required to push a few buttons, to a novice computer interface (such as Tandy's DeskMate), to a full-fledged professional GUI like Presentation Manager.

An SGUI would also allow users, as their skills and needs grow, to simply switch interface levels to access more powerful features. Ideally, an SGUI would allow users to choose among different looks (Windows versus Macintosh versus Next Step) and use different input devices (keyboard, mouse, stylus, touchscreen, voice, and so on) to drive the same applications at various levels.

Over the last 3½ years, Berkeley Softworks has devoted substantial resources to solving these complex interface and ease-of-use requirements. We believe a more flexible user-interface solution is required to break open the mass market. The industry needs to offer a solution that any user can access, regardless of his or her previous experience. The solution must be able to grow with the user without requiring expensive hardware upgrades. This leads to the second major challenge for mass-market PC success in the 1990s: the hardware/pricing equation. To date, the industry, led by Microsoft's system software requirements, has forced mass-market customers to live with hand-me-down solutions. All the innovation in the industry has occurred at the high end for the corporate market, where users can afford the expensive new machines. Efficient software development, which could bring many of these breakthroughs to low-cost mass-market machines, is rarely practiced. The message has been "If you can't afford to run with the big companies and buy new hardware every other year, you're doomed to run obsolete software." This is insane.

The potential mass market dwarfs the corporate market. Statistics show that during the 1980s, the percentage of the population employed by the Fortune 1000 companies dramatically declined. The majority of the population today is employed by small- to medium-sized businesses that can't afford to buy new hardware every other year. Add this to the consumer, home office, and K-12 educational markets, and you can see the potential. The industry needs to deliver innovative system and applications-software solutions for machines that have already been driven down the price curve.

New enabling system and application technologies targeted at the needs of the mass market will soon be available. These technologies will dramatically change the frame of possibility for low-cost, high-performance computing. The 1990s will finally see PCs deliver power to the people.

Brian Dougherty is the Chairman and CEO of Berkeley Softworks, a software developer and publisher specializing in system software and applications.
A. Have you heard the following comments by people:

1. This "user friendly" product sure isn't easy to use.

2. I have one computer operating system at home, another at work, and another on the remote computer I use. It is hard to keep the commands straight.

3. I have been doing all my work on a Vax. They just changed computers, and the I/O systems. Now I have to learn everything again. This is a complete loss for what I really need to do.

4. I only use that one system (or software) every four months. Then it is hard to remember the commands. Also they change the system about as often as I use it, so things are never the same.

B. Payback time

Suppose that it takes 10 hours to learn a certain system well enough that significant work can be done by using it. If this method offers a 30% saving over a previous method, how long does it take to break even on time used? The answer is certainly different for the case when the system is used for 20 hours per week compared to the case of using it only 1 hour per month. The analysis of this problem also helps to answer the question of how often one should change rules that affect users, even if they are desirable changes.
DOS vs. UNIX

Battle lines drawn in ‘Software Wars’

By Bob Bruce

If you’ve been thinking about acquiring or updating your business computer lately, you have likely been exposed to the question of DOS vs. UNIX.

Today, many PC manufacturers are stressing the point that their new 386-based machines are “XENIX-ready.” And a number of PC suppliers are saying that UNIX (or XENIX) is the next great up-and-coming operating system.

In the continuing saga of the Software Wars, the next battle seems to be shaping up over DOS (which stands for Disk Operating System) and UNIX (which stands for absolutely nothing.) Both creatures are forms of computer operating systems — specialized programs that live inside microcomputers and control things such as disk access, sending messages to the computer’s screen, copying and transferring files, and other sorts of input/output (I/O) and general housekeeping chores.

DOS, developed by Microsoft primarily for IBM’s line of personal computers, has been around as long as the PC. UNIX, developed by Bell Labs primarily for the kinds of minicomputers generally found on college campuses, has been around even longer.

DOS, intended for people of average intelligence in the business community and the general public, has what programmers refer to as a limited vocabulary. The latest release of DOS, for example, has maybe 37 different commands that do things like rename a file, list the current date and time, etc.

UNIX, intended for college students, professors, and research scientists whose brains have been fried by too many Cokes and Twinkies, has an almost unlimited vocabulary. Nobody really knows how many commands are in UNIX, since almost every installation has its own variation.

This user-customizable aspect of UNIX has great appeal for “power users” who have a lot of interaction with their operating system, but it tends to get in the way for the average business user.

In DOS, commands are spelled out as names that most people can recognize, such as TIME, DATE, FORMAT, and COPY. In UNIX, commands are obscure abbreviations like lc, Ip, nroff, and grep. This has led to UNIX being accused as a user-unfriendly operating system. Programmers, who form the strongest rooting section for UNIX, applaud this unfriendliness, since in their book users are a lower form of life anyway.

Even so, UNIX is almost always hailed as a more “powerful” operating system than DOS. Gary Jones, the owner of Front Range Software Services in Broomfield, has worked with both DOS and UNIX. He illustrates UNIX’s greater power with this comparison:

“In DOS, if you want to see a list of

Continued on page 28

UNIX’s strength is with software development, says Rick Cantwell, president of BVT Associates.
UNIX power has a price

Continued from page 17

your files you type DIR. You see a stream of file names come by with sizes and dates. If you put a /W on the end of the command, you can have the names listed in columns across the screen.

"With UNIX, you can combine the is command with some switches that would show just the dates and the sizes of the files, put them in columns across the screen, sort them in descending order, and run the whole process through the "more" command such that if it's going to fill up more than one screen, it'll pause at the end of each screen and wait for me to hit a keystroke."

While Jones admits that's not the most sophisticated of examples, it does illustrate UNIX's ability to "pipeline" the output of one operating system command directly into the input of a second command, all during the same process. For college researchers who deal with large files of tabular data, such features are real time savers. For business users who only want to run Wordperfect, such features are close to useless.

Which is not to say that UNIX is a total wash-out for the business environment. As Gordon Hoag, member of the technical staff of Logicon points out, UNIX has some very interesting productivity-monitoring features.

"You can tell UNIX to monitor your employees," Hoag says. "It'll tell you how many keystrokes they've been doing, what programs they've been running, and so forth." There's even a built-in way to track down internal software saboteurs, he says.

Benefits to users

There are even some benefits of UNIX as a user-modifiable command language that applies to business users, Hoag says. "In DOS, somebody can just walk up to your PC, type DEL *.*, and wipe out everything in your root directory. Why? Because DOS puts commands like that into the kernel, which is always loaded into memory, so the commands cannot be removed or altered."

In contrast, however, UNIX reads everything off of disk. This might seem slower, but it lets you rename "delete" to "XDELETE," for example, so you're the only one who knows what the command is called. You can even remove the command entirely from your working disk, thus protecting against unauthorized meddling.

But with all this power comes a price.

"UNIX tends to do things when it jolly well feels like it," he continues, "not necessarily when you command it. For example, if you've got several terminals tied into a PC and you're running UNIX, you can be typing away and then stop to talk on the phone. UNIX may decide, 'Well, this guy's not busy, so I'm going to leave his picture on the screen, and I'm going to take everything he's got in memory and write it to disk to make more room in memory for somebody else.'

"So when you resume typing, you'll enter in maybe 15 letters, look up on the screen, and none of them have happened. Then suddenly they all zing up at once because you've been loaded back into memory."

This is in contrast to a DOS machine, where the application you are running (say LOTUS 1-2-3, for example) is always active. Even if you leave your desk for two hours, when you return and hit a key, that keystroke is immediately entered and displayed.

Rick Cantwell, president of BVT Associates in Boulder, points out the real strength of UNIX. "UNIX is several orders of magnitude more efficient to do software development on. You don't have these silly little buggy machines with little buggy memory that you're constantly running into DOS. You can solve real live interesting problems on a UNIX machine."

At the same time, Cantwell admits, it's unlikely that UNIX will become the dominant business operating system simply because of cost. "DOS machines are very inexpensive. Whatever changes you make in hardware technology to make UNIX machines cheaper, you also make DOS machines cheaper. You can buy a very nice DOS machine for $1,000, but we've yet to construct a reasonable UNIX machine for less than about $4,000."

Dave Dodd, partner in Integrated Microsystems in Boulder, has a similar view. "DOS and UNIX really are not comparable as operating systems," he says. "UNIX is far more sophisticated, but DOS has maybe 100 times the installed base. DOS is where all the application developers are working, and that is what really sells systems in the final analysis."

Dodd speaks from the viewpoint of one who has worked on both sides of the DOS/UNIX fence. "We used to work in UNIX, and we would plug it and hype it just like the other UNIX people do now. But it's really up to the customer. If he wants to run word processing then he buys Word or Wordperfect, and they require DOS. Spreadsheets, Email, fax systems, the vast majority of these applications are written for the DOS marketplace."

"People will migrate (translate) these applications to UNIX," he observes, "but they do it more from the standpoint that bought the UNIX system to do CAD/CAM on a Sun workstation, for example, or to do some very powerful local processing. That's where UNIX is most popular — in the large scientific workstation."

How to spell relief

So as the DOS and UNIX camps square off against each other, where can the average business computer user expect to find relief? As PCs get more and more powerful, it will be easier and easier for them to run UNIX. Without the business applications to work in a UNIX environment, however, DOS will remain dominant, and UNIX will address primarily the scientific computing arena.

Of course, area experts say, don't forget about OS/2. Often described as the evolutionary next step beyond DOS, OS/2 is patterned after UNIX in many respects.

While OS/2 doesn't provide the same multi-user capabilities that UNIX does, OS/2 does provide better networking, according to some observers. Since it also maintains DOS compatibility, OS/2 hits the ground with a huge base of application software. But then some vendors are supplying packages called "DOS-under-UNIX" environments that allow users to run DOS applications, without modification, on a UNIX-based computer.
The Government Looks At Why Huge Technology Efforts Often Fail

State builds budget infobahn

White House ultimatum to fed IS: Shape up systems or lose funding

Airline turbocharges schedule efficiency

$1B award to fix air traffic systems

To Integrate Systems Or Not: The Latest Corporate Riddle

Tech goofs

IRS CIO: Agency will consider outsourcing

Lessons From The FAA's Costly Bid To Upgrade Air Traffic Control
Construction of Data Systems and Failures

Some examples of problems with data systems projects have been collected. This section has brief information about the projects. The actual news stories are in the next section.

1. September 1996: $1 Billion award to fix air traffic system.

After nearly a decade of mismanagement, faulty software and billion-dollar cost overruns, the Federal Aviation Administration is taking another stab at modernizing the nation’s antiquated air traffic control systems. (Computerworld, Sep 23, 1996)

2. July 1996: Agency has little to show for $300 million upgrade.

The Veterans Benefits Administration (VBA) has spent $300 million in the past 11 years on information systems modernization, but it still takes more than five months to process a veteran’s benefits claim — about the same time it took in 1990. (Computerworld, Jul 28, 1996)

3. January 1996: To integrate systems or not; the Latest Corporate Riddle.

UPS isn't alone. For some, integrated systems have been a nightmare, not a dream of data processing efficiency.

"During the 80's everyone wanted tightly coupled integrated systems," said Hugh Ryan, the director of architectures for Andersen Consulting, a unit of Chicago-based Andersen Worldwide. "But more and more, firms are finding they don't want that level of integration, and they want to break their systems up."

Not only are integrated systems tougher to change. When an integrated system fails, everyone, not just a single department, waits.

He added: "I remember looking at the grand integration projects...and thinking to myself, These are going to fail." (from Investors Business Daily, Jan 6, 1996)


American corporations spent an estimated $275 billion this year to improve information technology. Money well spent? Not all of it.

According to The Standish Group International, a market research firm, a full one-third of the money was essentially wasted. It yielded no real—or even a negative—return.
The lesson we learned is that it's sometimes better to have someone who knows the business working on the technology than someone who knows the technology but not the business. (Forbes, Dec 30, 1996)

Sometimes--it helps to know the business.

A hotel and car reservation system: it was just too big and complicated a project with too many experts involved. In 1992 we pulled the plug on Confirm. We have gone back to HILTRON, our worldwide reservation system, which we've built upon over decades. We learned that one needs to develop systems and implement them in little bits. Developing from scratch is the last resort.

The biggest lesson we learned was: Don't be taken in by glamorous looks and buzzwords.

Do not be taken in by glamorous looks and buzzwords

5. November 1996: White House ultimatum to fed IS: Shape up systems or lose funding.

The White House has given notice to federal agencies: Put some discipline in your systems development activities or risk funding cuts next year. (Computerworld, Nov 18, 1996)


The federal government spent more than $200 billion on computers and related information processing systems over the past 12 years, including $25 billion in 1993.

The federal government spent $200 billion. The benefit is unclear according to GAO.

"Despite this huge expenditure, it is unclear what the public has received for its money," say the introductory remarks of a new report by the U.S. General Accounting Office, the government watchdog agency. (Investor's Business Daily, July 12, 1994)
7. March 1996: Commercial IS policies pitched as federal fix.

Ask: what are the outcomes from the investment? (Computerworld, Mar 11, 1996)


A low cost system works well (cost was only $300,000). The design is based on simplicity. (Computerworld, March 25, 1996)


Another panel said that the requirements for the information system to handle data from EOS (earth observing) satellites should be limited and realistic, the architecture should be open, and the data products should be mainly the responsibility of the principal investigators. The EOSDIS is behind schedule and has suffered technical problems (Nature, Mar 20, 1997 and Nature 377, 1995, p. 191).

A. The budget of NASA EOSDIS is as follows:

<table>
<thead>
<tr>
<th>Year-by-year costs of EOSDIS (Valid May 1995)</th>
<th>FY91</th>
<th>FY93</th>
<th>FY95</th>
<th>10-year cost</th>
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</thead>
<tbody>
<tr>
<td>b. Project office (run by Goddard)</td>
<td>$22.8M</td>
<td>$46.0M</td>
<td>$138.0M</td>
<td>$1190M (1991-2000)</td>
</tr>
<tr>
<td>c. ECS contract</td>
<td>0</td>
<td>$17.5M</td>
<td>$83.2M</td>
<td>$826M (1993-2003, 11 yr)</td>
</tr>
<tr>
<td>Total</td>
<td>$35.9M</td>
<td>$94.7M</td>
<td>$259.9M</td>
<td>$2377M</td>
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</table>

B. Part of the budget is for eight archive centers (DAACs) and a first version of the software:

<table>
<thead>
<tr>
<th>FY94</th>
<th>FY95</th>
<th>FY96</th>
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</thead>
<tbody>
<tr>
<td>DAAC total</td>
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<td>$26.8M</td>
</tr>
<tr>
<td>Other VO</td>
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</tr>
<tr>
<td>Total</td>
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</tr>
</tbody>
</table>


Two states (Iowa & North Carolina) went shopping for what observers call "Cadillac networks." Kentucky wanted a good network for a good price. (Computerworld, April 24, 1995)

The National Weather Service (NWS) is building the AWIPS system for interactive data processing and display. It will cost $525m or more. The US General Accounting Offices (GAO) suggests that it will not deliver the payoff in better forecasting that NWS has promised. (Science, 8 Mar 1996)


The White House last week directed all executive branch agencies to consolidate small and midsize data processing centers into more efficient larger centers or outsource their operations entirely (My note: their argument about MIPS can be misleading). (Computerworld, Oct 9, 1995)


The General Accounting Office (GAO), in contrast, concluded last July that "Defense continues to spend about $3 billion annually to develop and modernize automated information systems with little demonstrable benefit. Few redundant systems have been eliminated, and significant savings have not yet materialized. (Scientific American, April 1996)

• Not much benefit to demonstrate
• Significant savings have not happened


Application development projects are still the black eye of some information systems organizations: Nearly one-third of all projects fail and more than half come in over budget.

Coming in with a 9% success rate, large companies suffer from projects that are too large and have too many requirements to fulfill on a timely basis, the research firm said. (Computerworld, Dec 12, 1994)


To date, the Internal Revenue Service has spent $4 billion on modernizing the agency's beleaguered information technology systems. Even so, "The tax Systems Modernization program has been a complete disaster," said Rep. Rob Portman (R-Ohio), co-chairman of the National Commission on Restructuring the IRS. "Clearly, the IRS needs outside help to get the modernization job done."
The tax systems modernization program has been a disaster.

In its report, the GAO said the 2-year old SCRIPS computerized imaging system performed "significantly better" last year than in 1995, but it still failed to deliver on many of its promised benefits.

Yet the cost for SCRIPS continues to climb, while labor savings remain less than expected. In 1995, it actually processed one type of form, the 1040EZ, 7% slower than when done by hand. (Computerworld, Feb 3, 1997)
$1B award to fix air traffic systems

By Gary H. Anthes
WASHINGTON

After nearly a decade of mismanagement, faulty software and billion-dollar cost overruns, the Federal Aviation Administration is taking another stab at modernizing the nation's antiquated air traffic control systems.

Last week, the FAA awarded an estimated $1 billion contract to replace the 20-year-old systems that control air traffic near airports. The systems are expected to improve safety and reduce flight delays at 371 airports and military bases, with installation stretching out to 2007. The first commercial installation will be at Boston's Logan Airport in 1998.

The systems will support safety enhancements urged by the recently appointed presidential commission on aviation safety, Transportation Secretary Federico Peña said.

The prime contract went to Raytheon Co. in Lexington, Mass., which will supply software for processing and displaying radar data for aircraft within about 50 miles of airports, where the congestion is greatest. Computer systems will come from Sun Microsystems, Inc. and backup software from Hughes Aircraft Co.

The system, the Standard Terminal Automation Replacement System (STARS), will be used by the FAA and the U.S. Department of Defense.

Although most experts say the U.S. air traffic control systems are safe, they are neither 100% safe nor 100% reliable. Ancient computers, which fail often, are backed up by systems that lack many of the primary systems' safety features.

The Raytheon software will run simultaneously on four Sun computers at each facility so that one primary and backup pair is mirrored in a secondary primary and backup array. The Hughes backup software can be used if bugs stop the Raytheon software from working properly.

When asked to assess the importance of the Raytheon contract, Barry Krasner, president of the National Air Traffic Controllers Association (NATCA) in Washington, would say only, "I don't care where the system comes from, as long as it works."

A source at NATCA, the controllers' labor union, said he had plenty of confidence in Raytheon but considerably less in the FAA's ability to manage a big systems development effort.

Conceived in the mid-1980s, the FAA's air traffic control modernization program has been plagued by huge cost overruns and missed deadlines. In 1994, the $7.6 billion program, which included what has now become STARS and two other systems, was downsized and restructured. Many of the overruns stemmed from complex requirements that had to be built in to millions of lines of custom Ada code. As a result, in addition to scaling back requirements, the FAA began searching for existing software that could be tailored to its needs.
Agency has little to show for $300M upgrade

By Gary H. Anthes

WASHINGTON

The Veterans Benefits Administration (VBA) has spent $300 million in the past 11 years on information systems modernization, but it still takes more than five months to process a veteran's benefits claim — about the same time it took in 1990.

The U.S. General Accounting Office has identified three main problems at the VBA: lack of an overall business strategy linked to IS, lack of measurable goals for IS and primitive software development practices.

"Unless the VBA takes more aggressive action to effectively address its serious management and technical weaknesses, its modernization efforts will not succeed," said Gene Dodaro, an assistant comptroller general at the GAO. He recently spoke before the House Veterans' Affairs Committee.

Dodaro said the VBA needs to take the following steps:

- Create a credible business strategy and supporting IS plan.
- Develop a disciplined investment strategy and methodology for selecting and managing IS projects.
- Strengthen its technical capabilities in software development.

Officials at the VBA, which is part of the U.S. Department of Veterans Affairs, didn't challenge the findings. They said they are moving vigorously to correct deficiencies.

R. John Vogel, Undersecretary for Benefits, said the VBA is working on a business plan and "performance objectives and indicators" to track systems development progress and determine how it will affect service to veterans.

The VA's lack of progress in speeding service to veterans has come into sharp relief as a result of Vice President Al Gore's "reinventing government" initiative, which was launched three years ago. A key tenet of Gore's National Performance Review was that federal IS expenditures must be based on the promise of tangible, measurable benefits to the public.

The GAO said the VBA had, for example, bought 24 minicomputers between 1993 and 1995 without a clear plan for how they would be used. Some of the machines sat idle for two years, according to the GAO.

The GAO recommended that the VBA curtail IS development that is "not day-today critical" until it has overcome its planning and management weaknesses. And Rep. Terry Everett (R-Ala.) threatened to introduce legislation that would "require [the] VA to submit its [IS] plan to an appropriate body for review before proceeding with new modernization projects."

The GAO was particularly harsh in assessing the VBA's software development practices, calling them "ad hoc and chaotic."

"None of the projects reviewed satisfy any of the criteria required for a repeatable process," GAO officials said.

The VBA drew some support from the Veterans' Claims Adjudication Commission, which was established by Congress to review veterans' claims processing. "We [have] heard a number of things that I characterize as good news regarding strategic management," said Rhoda Davis, a member of the commission.

The IS spending at the Veterans Benefits Administration:

<table>
<thead>
<tr>
<th>Year</th>
<th>IS Spending</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>1992</td>
<td>$85M</td>
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<tr>
<td>1993</td>
<td>$132M</td>
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<td>1994</td>
<td>$110M</td>
</tr>
<tr>
<td>1995</td>
<td>$101M</td>
</tr>
</tbody>
</table>

Source: Veterans Benefits Administration, Washington
When there is too much systems integration:
- It is time consuming and costly to make necessary changes.
- A change can cause other problems.
- For some, integrated systems have been a nightmare.
- People are moving more toward loosely coupled systems.

To Integrate Systems Or Not: The Latest Corporate Riddle

By Matt Krantz
Investor’s Business Daily

United Parcel Service of America Inc. had a simple idea in the early ’90s. At least it sounded simple at first.

The Atlanta-based delivery firm decided to automate its freight-collect process. That’s when a UPS truck driver bills a package recipient for shipping. Freight collect, common outside America, is similar to cash-on-delivery, or COD.

But no one guessed it would take close to nine months to change UPS’s current package shipping software. Taking paperwork away from drivers seemed a simple goal. Why the delay?

Every piece of UPS’s shipping system, from data entry to accounting, is baked into one giant program. It’s an integrated system, a design that has gained popularity in the last decade. It allows departments to share data with each other.

But that means a simple change can have a domino effect. “The ISPS (International Shipment Processing System) is so big, it can be hard to put in changes,” said Jim Medeiros, a systems manager for the privately held firm.

“After any change, you have to test the whole system.”

UPS isn’t alone. For some, integrated systems have been a nightmare, not a dream of data processing efficiency.

“During the ’80s, everyone wanted tightly coupled, integrated systems,” said Hugh Ryan, the director of architectures for Andersen Consulting, a unit of Chicago-based Andersen Worldwide. “But more and more, firms are finding they don’t want that level of integration, and they want to break their systems up.”

Not only are integrated systems tougher to change. When an integrated system fails, everyone, not just a single department, waits.

“Fortunately, we’ve kept the system up 99% of the time,” said UPS’s Medeiros. “But when it does go down, we can’t move a package.”

So the new question is, does integration cause more problems than it solves?

It can take a month for UPS to guess what a change will mean for the ISPS system as a whole, Medeiros says. Actually programming the changes can take up to nine months, he adds.

Similar criticisms are being leveled against off-the-shelf integrated software. That includes software made by SAP AG of Germany. Its software tightly links every piece of a company’s systems, including financials, human resources, manufacturing and shipping.

Changes can have a ripple effect. Even so, SAP has roughly 8,000 customers worldwide.

Problems with integration have birthed another architecture: loosely coupled systems.

“We needed a way to share information (between business units) without the complexity of integration,” said Joe Smialowski, chief information officer of Sears, Roebuck and Co. in Hoffman Estates, Ill.

Two years ago, Smialowski rearranged all of Sears’ systems. He put them into what he calls an “island model.”

Under the model, each of Sears’ seven business units — department stores, specialty stores, mail order, credit, logistics, home services and corporate functions — still runs its own system, or island, which range in age from brand new to roughly 15 years old. These units also employ their own systems staff.

But there’s one catch. Each Sears system must pass financial and customer data to the central system in an approved format.

This approach shortens the time it takes to make changes, Smialowski says.

“When it’s time to deliver a solution, each island doesn’t have to worry about integrating with the other islands,” Smialowski said.

He added: “I remember looking at the grand integration projects . . . and thinking to myself, ‘These are going to fail.’ ”

Sears never integrated its systems. But for other firms that did integrate, tearing them apart again can be very difficult, says Andersen’s Ryan.

“Integration is something that if you decide on doing it upfront, you stick with it,” Ryan said. For example, he adds, many insurance firms, quick to jump on the integration bandwagon, now are struggling with ways to break up the pieces.

“The topic of breaking up systems is going to get hotter,” he said.

Oracle Corp. of Redwood Shores, Calif., already is claiming to sell a solution. The firm sells software to handle back-office tasks. Each function, be it order entry or accounting, is contained on a software “cartridge,” said Nimit Mehta, the firm’s senior vice president of industry applications.

That way a firm can unsnap pieces of software no longer needed, without taking down the whole system, Mehta said.

Not everyone is so dour on integration.

Inland Steel Industries Inc. just finished a three-year project to integrate its order management systems for different products. The project, completed in Nov. ’96, cost roughly $36 million.

“‘I’m of the view that more integration is better than less,’” said William Howard, Chicago-based Inland’s chief information officer. “Fragmentation gives quite inefficient views of the business.”

Inland’s integrated system lets managers check on orders for steel and iron ore products, in real time. For instance, if a customer calls, a manager can get an order’s exact status — even identifying which warehouse contains the product.

Integration makes this happen. “It’s important to have a (companywide systems) architecture,” Howard said. “You can’t plan systems department by department.”

Jan 6, 1996
Investor’s Business Daily
Tech goofs

By Shailaja Neelakantan

American corporations spent an estimated $275 billion this year to improve information technology. Money well spent? Not all of it.

According to The Standish Group International, a market research firm, a full one-third of the money was essentially wasted. It yielded no real—or even a negative—return.

Here, seven corporate executives talk about their technology disasters and draw some lessons from them.

Douglas Schwin
Senior Vice President
Information Systems
FoxMeyer Drug Co.
(now McKesson Corp.)

We spent $18 million to open a new warehouse with automated pricing and picking devices which move products around like a conveyor belt. The system was developed by an outside consultant. We take orders late at night and deliver in the early morning. There are thousands of these orders.

The system blew up on us. It couldn’t handle the volume of data and kept shutting down. Once we started it up again, it lost chunks of data about the orders. People were running frantically all night from shelf to shelf trying to get orders in. We lost millions compensating customers for late arrivals. We lost even more money air shipping orders that would normally have been trucked.

We knew on the launch date the system was flawed, but we had already shut down our only two other warehouses. We went into a product that wasn’t ready for us and that we weren’t ready for. In fact, it helped send us into bankruptcy. What did we learn? Not to be overimpressed by technology.

Richard Liddy
Chief Executive
General American Life Insurance

Our in-house technologists devoted six years and $1.6 million to building a system for our reinsurance business, but it was too slow and cumbersome. Every time we wanted to change how we calculate premiums, we had to redo the software.

Lloyd Sloan, one of our actuaries, used to be a mathematics teacher at a local college.

He kept saying that we should move away from the mainframe to a more decentralized system where software development would be in the hands of the users. But we listened to the technology whizzes.

Finally we decided to let Sloan take a shot at it even though he had no technical degree. When we told our systems people that Sloan was taking over the project, they were shocked—but glad to get rid of it.

“The new system is going to fall flat on its face, but don’t call us to come back and pick up the pieces,” they said. Well, it did work.

The lesson we learned is that it’s sometimes better to have someone who knows the business working on the technology than someone who knows the technology but not the business.

Dan Potter
Founder and President
1-800-CONTRACTOR
(a referral service covering southern California)

My partner and I started this company two years ago, and it has been growing so quickly that we are constantly buying computers. As a penny-pinching startup, we made a mistake by buying the cheapest computers. They kept quitting and freezing on us. It took us four trips to the store to return the monitor. When we got totally fed up, we sold them off at a worse discount than we bought them.

Then we went to the other extreme. We bought top-of-the-line computers and ended up spending a lot more than necessary. Now we are sticking with mid-level stuff assembled locally by PC Club, a bare-bones wholesaler nearby. Their quality is comparable to the best—and we get better service, because they are local. My motto, which I learned the hard way, is that $2,000 is the right amount to pay for a computer.
Two-thirds of technology projects run into trouble. On average, they take three times longer than estimated. They also cost three times as much. Worst of all, the systems deliver only 40% of features techies promised.

"Developing the whole computer system from scratch is the last resort."

Joseph Durocher
Chief Information Officer
Hilton Hotels Corp.

In 1988 Hilton, Marriott, Budget Rent a Car and AMR Information Services spent $125 million on a reservation system called Confirm. The technology people at our companies started with a blank piece of paper.

It was just too big and complicated a project with too many experts involved. In 1992 we pulled the plug on Confirm. We have gone back to Hiltron, our worldwide reservation system, which we've built upon over decades. We learned that one needs to develop systems and implement them in little bits. Developing from scratch is the last resort.

Thomas Higgenorson
Senior Vice President
Hygrade Distribution & Delivery

We try to be bleeding-edge in the technology we use—but being a leader means that sometimes we pay the price. We developed a $1.5 million warehouse-management system for Federated Department Stores to link them to manufacturers.

We hoped to use the system to speed up delivery of big-ticket items. Customers don't like to wait for delivery, and stores don't like to carry big inventories of this stuff. Using our system, the store would be hooked up via computer with the manufacturer and electronically transmit the customer's order to us. Our system would then generate the delivery schedules immediately.

The six-month pilot test worked beautifully. But when we tried to integrate all of Federated's stores, we realized that the concept was bankrupt from the start. Every Federated store—be it Macy's, Sterns or Bloomingdale's—does its buying individually, from different manufacturers. The system we designed required centralized buying.

We learned we need to know our clients a lot better. We can't be cutting-edge with every account. Next time we will work with clients who have centralized purchasing, like Kmart and Wal-Mart.

Kurt Lieberman
Vice President, Support Services
Reynolds & Reynolds
(supplier of information systems to the automotive and health care industries)

When we needed a new software program for distribution, we bought it from a vendor with a much-touted hot technology. After we got it, we realized the program couldn't handle our complex scheduling. It's ironic: Technology is our business—yet we got taken. How could it happen? The software simply looked very snazzy—it had lots of colorful graphics—and seemed easy to use. We went back to our old program and upgraded. The biggest lesson we learned was: Don't be taken in by glamorous looks and buzzwords.

Dr. Edith W. Martin
Chief Information Officer
Eastman Kodak

In 1990 we outsourced our telephone and computer networks to Digital Equipment in a five-year contract. We didn't think the telephone system was good enough, or that Digital could improve it. We moved that service to Nortel in 1993.

What did we learn? Not to outsource an activity to an organization, no matter how capable it is, unless it's their core competence.

What's on your mind?
If you are a business executive, whether with a big company or a small one, we'd like to know what's bothering you these days, and what you are doing about it. Tell us about it at: mind@forbes.com.
White House ultimatum to fed IS:
Shape up systems or lose funding

By Gary H. Anthes
WASHINGTON

The White House has given notice to federal agencies: Put some discipline in your systems development activities or risk funding cuts next year.

The concept is right on,” said Neil J. Stillman, deputy CIO at the U.S. Department of Health and Human Services.

“They are very serious about this. This is a new era, using different kinds of yardsticks for federal information systems,” said J. Timothy Sprehe, a former Office of Management and Budget (OMB) official and now president of Sprehe Information Management Associates in Washington.

“They are serious about this. This is a new era, using different kinds of yardsticks for federal information systems,” said J. Timothy Sprehe, a former Office of Management and Budget (OMB) official and now president of Sprehe Information Management Associates in Washington.

“Support core functions of the agency
“Support more-efficient work processes
“Project a superior return on investment
“Comply with federal and agency IS standards and architectures
“Establish clear measures for project progress and secure buy-in from users
“Be implemented in small, phased-in pieces

Source: Office of Management and Budget, Washington

But I think the timing is impossible,” he said.

Stillman said evaluating projects against the criteria would be appropriate when the departments are preparing the fiscal 1999 budget next year.

“Thereafter, it will be very valuable to departments, to OMB and to the process,” he said.

Alan P. Balutis, deputy CIO at the U.S. Department of Commerce, called the OMB criteria “a useful checklist but not a detailed guide on how to conduct [the development process].”

He said Department of Commerce would meet the deadline within a day or two.

Asked if Commerce Department systems projects would meet the criteria, Balutis said, “I would sure hope so.” He said he wasn’t worried about threatened budget cuts for troubled projects.

But Sally Katzen, head of OMB’s Office of Information and Regulatory Affairs, said OMB will take a hard line on systems that don’t measure up.

“We are not going to accept. We have satisfied criteria A, B and C, and — wink, wink, wink — can’t we get through this gate?” she said.

“I’d be very surprised if everything currently being funded remains funded,” Katzen said.

“OMB will recommend new or continued funding only for those major systems investments that satisfy these criteria,” Director Franklin D. Raines warned the agency leaders in the Oct. 25 memo.

The agencies had until Nov. 12 to supply a list of projects for which more funds are needed, with an evaluation of how well they meet the eight criteria.

Reaction to the memo varied among federal chief information officers.

The majority said the criteria

Source: Office of Management and Budget, Washington

Nov. 18, 1996

Computerworld
The Government Looks At Why Huge Technology Efforts Often Fail

By Brian Deagon
Investor’s Business Daily

The federal government spent more than $200 billion on computers and related information processing systems over the past 12 years, including $25 billion in 1993.

“Despite this huge expenditure, it is unclear what the public has received for its money,” say the introductory remarks of a new report by the U.S. General Accounting Office, the government watchdog agency.

Computers & Automation

The GAO has sent numerous reports to Congress over the last 10 years documenting government’s failure to effectively manage information and technology.

The examples would seem hilarious were they not so tragic:

- About $4 billion in child support payments go uncollected each year due to problems of state and federal agencies in sharing data electronically.
- When a trainload of toxic pesticide spilled into California’s Sacramento River in 1991, weeks passed before the Environmental Protection Agency could locate the studies it had on the dangerous chemical. They were buried in a mass of hundreds of thousands of pesticide reports.
- The Navy has spent 17 years developing an automated payroll personnel system that was supposed to have been operational 10 years ago.
- In 1992, the GAO identified more than $7 billion in cost overruns related to information technology projects. And this year, the Federal Aviation Administration affirmed it was $2.1 billion over budget on a 10-year effort to upgrade the nation’s air traffic control system.
- The Internal Revenue Service has twice tried and failed to modernize its antiquated tax-processing system during the past 25 years. Nonetheless, the IRS will spend $22 billion over the next 10 years on a new effort.

Money Torrent

“It’s a loose firehose,” said David McClure, GAO’s assistant director for strategic information management. “Money is being spewed all over the place, and it’s not clear at all if things are getting better.”

The GAO issued two major reports, in 1988 and 1992, that underscored the problems government has in developing information technology. Its latest major report takes a different approach, however:

“Rather than continuing to analyze the causes of failure, we decided to learn how leading organizations, private or public, consistently apply information technology to improve mission performance,” the new report said.

The GAO consulted with 20 experienced information technology managers from the public and private sectors who analyzed information management practices at 19 organizations in the private sector, and at state and federal government levels.

The information practices of organizations it studied for the report include: Xerox Corp. and United States Automobile Association in the private sector, the states of California and Florida, and in the federal sector, the Commerce Dept. and the Social Security Administration.

The report, “Improving Mission Performance Through Strategic Information Management and Technology,” is available to the public through the GAO’s offices in Gaithersburg, Md. The reference number is GAO/ADM-94-115. In general, the report is free, though the GAO may charge about $2 a copy for bulk purchases.

“The response has been overwhelmingly positive,” said McClure. “We’re pushing this report into every agency we can.”

Reengineering Troubles

To be sure, government is not alone with its information technology troubles.

Many private-sector attempts to restructure business processes around new information technology platforms—a process called reengineering—have failed. And those that succeed are often over budget and behind schedule.

A new survey by Arthur D. Little Inc. of 350 executives in 14 industries revealed that almost 70% experienced unanticipated problems related to information technology pro-

grams.

Another study by CSC Index Inc. reveals that about half of companies surveyed are dissatisfied with reengineering programs, according to Computerworld, a leading computer newspaper.

But no organization spends more money on computer technology than the U.S. government, which explains why its reengineering failures are the largest on record. With that in mind, the GAO hopes its new “executive guide” will stop the hemorrhaging.

The GAO’s Report

Many good books on reengineering have been published over the last three years. The GAO’s new 45-page report is more like an information pamphlet, but unique for its clarity, brevity and simplicity.

According to the report, three factors stood out in the conversations held with leading executives about the importance of strategic information management:

- Size and neglect: Information technology and information assets are typically substantial, poorly understood and undercontrolled areas of capital investment and expenditure. Typically they are growing, not shrinking.
- Risk: Large, complex information systems projects have an inherently high risk of failure, delay or overspending.
- Benefits and leverage: In most organizations, information and information technology influences the quality, cost and speed of nearly every major function, as well as decision-making, productivity and morale.

July 12, 1994

Investors Business Daily
Commercial IS policies pitched as federal fix

By Gary H. Anthes

"Why can't a woman be more like a man?" asked Henry Higgins in the musical My Fair Lady. On Capitol Hill recently the refrain was, "Why can't government be more like the private sector?"

Witessess took turns telling a congressional committee what is wrong with information systems management in government. They said "best practices" borrowed from the private sector—such as business process re-engineering, benchmarking and return-on-investment analysis—might help the government get more bang for its IS bucks—which total $25 billion annually.

"Traditional government represents the ultimate in centralized, bureaucratic control," said Peter W. Huber, a senior fellow at the Manhattan Institute for Policy Research in New York, who testified before the committee.

Huber said the government should outsource much of its IS work and decentralize the rest. He also recommended firing middle managers, who largely exist to pass information above and below. "Informational midwives aren't needed any more," he said. "E-mail...Lotus Notes and wide-area networks do the conveying much better."

Renato A. Di Pentima, former chief information officer at the Social Security Administration, said government must shift its focus to the benefits that systems bring. In many agencies, the success of a project to install 40,000 PCs would be defined by whether the agency installed the systems on time and within budget, he said.

"But what outcomes are you getting from that investment?" he asked. "Are people waiting 15 minutes instead of an hour when they come in to a local office? Can you answer their questions correctly 98% of the time?"

Indeed, the White House Office of Management and Budget recently announced that it will start requiring agencies to state program goals in their annual budget requests. Beginning in 2000, agencies must also report actual performance compared with goals.

But Paul A. Strassmann, who has held senior IS posts in government and industry, said the move to performance-based budgeting and program management is no silver bullet.

"This will just create more bureaucracy," he said. "They'll have more forms to fill out to justify things. Those guys know how to tweak the numbers anyway."
Airline turbocharges schedule efficiency

By Thomas Hoffman

The best on-time performance. The fewest customer complaints. The lowest number of lost bags.

Southwest Airlines Co. has snared the U.S. Department of Transportation’s coveted “Triple Crown” of airline service awards for an unprecedented four consecutive years (see chart, page 137).

To keep a firm grasp on its No. 1 ranking, the Dallas-based airline recently automated a gaggle of flight scheduling processes under an information systems project expected to deliver up to 20-to-1 productivity gains.

And in keeping with its discount image, Southwest has so far spent a mere $300,000 since February 1995 to develop its new systems. That’s more than cost-effective when compared with the $1.2 million in shrink-wrapped software that vendors pitched to Southwest — proposals that didn’t include system interfaces to the airline’s reservations and maintenance systems.

Most airlines already use linear programming technologies to optimize flight and crew schedules, “but there’s a lot more that airlines can do with technology to improve upon these processes,” said Mark Shields, a principal in the aviation practice at Mercer Management Consulting in Washington. Unlike competitors such as United Airlines, which manages multiple aircraft types across international regions, Southwest flies only Boeing 737s on domestic routes.

Perfect fit

As such, Southwest would likely gain more from automating its flight planning activities than most airlines “since it has a formula that plays on simplicity,” Shields added.

The airline is hoping to do just that. Its project, called the Southwest Airlines Integrated Flight Tracking System (Swift), is a set of Unix Motif-based programs that the airlines’ 37 dispatchers and routers began using last fall to track 2,200 daily flights. The systems were built using Cambridge, Mass.-based Integrated Computer Solutions, Inc.’s Builder Xcessory tool.

Bon voyage

Southwest has been awarded the U.S. Department of Transportation’s “Triple Crown” four years running.

Online performance (Percent of total flights that were on time)

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<th>Airline</th>
<th>Percent</th>
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<td>80.6%</td>
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Customer complaints per every 100,000 passengers

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Lost luggage per every 1,000 passengers

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</tbody>
</table>

Source: U.S. Department of Transportation

Dispatchers armed with Silicon Graphics, Inc. Indigo II workstations are now able to click onto Motif buttons to calculate how much fuel is needed for a flight or to route a plane around bad weather, according to Mark Mortland, the lead programmer on the Swift project. Previously, these tasks were performed manually.

Later this year, Southwest will add other applications to Swift to address flight planning, maintenance and other functions, said Marty Gephart, a systems engineer and a Swift project leader for the $2.9 billion carrier.

Chain reaction

To date, Swift has enabled Southwest’s dispatchers to reroute passengers from canceled or delayed flights 20 times faster than it could using manual techniques.

For example, if a 2 p.m. arrival into Houston is going to be 20 minutes late, the dispatchers and routers can click on a series of Motif buttons to figure out how that will affect the outgoing 4 p.m. flight and connecting flights for passengers.

Gephart explained.

Prior to Swift, dispatchers and routers had used a 17-ft.-long flow sheet that contained all of Southwest’s daily flight information. Although they had become proficient at scanning the flow sheet, dispatchers and routers often took up to 15 minutes to check the airline’s reservation system and passenger lists before coming up with a set of rerouting options.

“We were missing opportunities to protect the customer because there was so much data to look for” on the flow sheets, said Dave Jordan, director of flight dispatch at Southwest.

But by using their Indigo II workstations, staffers can now get that information in just 15 seconds by accessing a Sybase, Inc. 10.0.2 relational database management system through Hewlett-Packard Co. K400 servers.

That speed is critical to Southwest, which added 300 daily flights last year after expanding its arsenal from 191 planes to 226 aircraft in 1995.

The largest U.S. insurer is also looking to maintain a competitive edge. See page 51.
Panel seeks ‘fundamental’ shift in handling of observation data

[WASHINGTON] The US Mission to Planet Earth (MTPE), which includes a multibillion-dollar series of satellites to observe the planet, oceans and atmosphere, is undergoing yet another major review that may complete the programme’s evolution from the use of large, centralized spacecraft to a smaller and more distributed system.

One early result of the review is “an absolutely fundamental change in philosophy” as to how data from the Earth Observing System (EOS) of satellites are disseminated, according to Steven Wofsy, an environmental scientist at Harvard University and the new chair of NASA’s advisory group for Earth science.

Since it began in 1991, the MTPE has been revised on many occasions, its spacecraft have shrunk in size, and its projected budget has dropped from $18 billion to just over $6 billion. But the current issue is not money. NASA is revamping the programme at a time when the budget appears stable and the first launch — of the AM-1 spacecraft — is only a year away.

Michael Mann, the agency’s deputy administrator for Earth science, says the purpose of this first biennial review is to develop a strategy for the mission “that allows us to be flexible” and to respond to criticisms and recommendations from outside groups.

The latest — and probably bluntest — such criticism came recently from Wofsy’s panel, which is part of the NASA Advisory Council. In a letter sent last week to Daniel Goldin, NASA administrator, the council made three pointed recommendations.

First, it said there should be a “fundamental change” to the EOS Data and Information System (EOSDIS) designed to process, archive and distribute data from dozens of orbiting instruments. “The requirements should be limited and realistic, the architecture should be open, and the data products should be largely the responsibility of the principal investigators.”

The EOSDIS is behind schedule and has suffered technical problems, most recently when it failed a major integration test early this year. The data system, which before the current review was projected to cost as much as $2 billion, has been singled out for reform by other review panels. They have advised NASA to move away from large, centralized databases to a “federation” of smaller data providers (see Nature 377, 191; 1995).

NASA is committed to having some kind of EOSDIS in place for the AM-1 and Landsat 7 missions, but Mann. But it has suspended work on subsequent versions. The EOSDIS could even be scrapped altogether, with scientists simply releasing processed data from individual instruments over the Internet.

Wofsy’s panel argues that whatever system takes its place should serve scientists first. “Those components of the current system that do not meet limited requirements for defined scientific and applications users should be cancelled or modified. Critics say one of the problems with the current EOSDIS is that it has been asked to serve too many masters, from scientists to schoolchildren to the general public. Mann says non-scientist “customers” might still be provided for, depending partly on the cost.

The advisory council also recommends — and NASA has tacitly agreed — that all EOS missions after PM-1 in 2000 (for which hardware is already being built) should be “completely re-examined” to favour smaller, faster missions that can take advantage of new technology and new scientific thinking.

The programme may even set a new competition to provide the instruments to be flown on CHEM-1, the next spacecraft in the series, even though some investigators have been working on the project for nearly a decade. Wofsy says the MTPE will benefit from continually re-evaluating the scientific questions it asks, and from being able to fly a greater number of “hypothesis-driven missions” with shorter turn-around times. One model for this approach is the new low-budget Earth System Science Pathfinder series of missions, the first two of which were to be selected this week.

Finally, says the panel, next year the MTPE programme should shift from its heavy emphasis on spacecraft observations to “substantially increase the resources devoted to in-situ and process studies, modelling and analysis”. In other words, less money should be spent on orbiting hardware, and more on ground- and aircraft-based research.

Yet to be decided is how all these reforms will affect one of the EOS system’s original goals, namely to gather the same key measurements from the same set of instruments flying in space over many years, in part to avoid calibration problems that make it difficult to work out long-term trends.

Some supporters of the MTPE worry that such a sweeping re-evaluation of the programme as it approaches its first launch signals confusion and a lack of clear goals. Others applaud the new flexibility as a sign of progress, a liberation from NASA’s old practice of locking in technologies and scientific strategies years ahead of a launch, which bars new ideas.

That debate is certain to be taken up in Congress this year. Hearings on the Mission to Planet Earth were due to be held before the House Science Committee’s subcommittee on space this week.

Senate bill seeks controls on genetic data

[WASHINGTON] A far-reaching bill that would bar employers and insurers from discriminating on the basis of genetic information was introduced into the US Senate last week by Pete Domenici (Republican, New Mexico).

The bill has been welcomed by consumer and privacy advocates. But it is opposed by many researchers, who argue that it would impose new responsibilities and procedures on them. Francis Collins, director of the National Human Genome Research Institute, called the bill impracticable.

The Genetic Confidentiality and Nondiscrimination Act of 1997 would also require any third party to obtain a donor’s informed and written consent to “collect, store, analyze or disclose an individual’s genetic information”. The bill’s wording has been slightly revised from a 1996 version; for example, a provision establishing an individual’s ownership of his or her DNA has been deleted.

But some researchers say that the bill would still cripple research by drastically reducing access to tissue samples from the country’s vast library of stored pathological specimens. The bill is “unacceptably restrictive and burdensome”, says one.

The bill has been referred to the Senate Labor and Human Resources Committee, whose chairman, James Jeffords (Republican, Vermont), is one of the bill’s co-sponsors.

Meredith Wadman

Tony Reichhardt
State builds budget infobahn

By Mitch Betts
FRANKFORT, KY.

Iowa floated a bond issue to build its own fiber-optic information superhighway for $100 million. North Carolina got legislative appropriations to outsource its $160 million information superhighway.

Those states went shopping for what observers call "Cadillac networks." But the commonwealth of Kentucky is taking an approach that is more like buying a Chevy on the installment plan.

The so-called information highways typically carry voice, data and video traffic — using Asynchronous Transfer Mode (ATM) or frame-relay technology — for schools, universities, medical centers and state and local government agencies. Local businesses can also piggyback on the networks.

Last December, Kentucky awarded an information highway contract worth $8.7 million the first year and perhaps $80 million over its 10-year life. The winning bid came from a team of local exchange carriers led by South Central Bell Telephone Co. in Louisville, Ky., and LCI International, Inc., a McLean, Va.-based long-distance carrier.

However, the contract is on hold because the three losing bidders — AT&T Corp., MCI Communications Corp. and MFS Communications Co. — have filed protests complaining that the local exchange carriers had unfair advantages in the competitive bidding process.

David A. Ballard, director of network services at Kentucky's Department of Information Systems, said he hopes the dispute will be resolved by July so that migration from the state government's leased lines to the Kentucky Information Highway can begin.

Happy with price

In essence, Kentucky decided to pay for the new network out of its regular telecommunications budget because getting additional funds from the legislature was out of the question.

"One reason [for the pay-as-you-go approach] is that we don't have any money," quipped Stephen N. Dooley, commissioner of the IS department.

"Our goal was to break even [with the current budget], but we were able to get significant cost savings. We're ecstatic about the pricing," Ballard said. The win.

Kentucky building budget infobahn

CONTINUED FROM PAGE 67

A key feature of the state's request for proposals (RFP) was the requirement for a network access point in each of the state's 120 counties, not just in the major cities. With such access points, even the state's most rural areas would not face higher, distance-sensitive charges for access to the backbone.

"Kentucky wanted the cost of access [to be] the same for everybody, even though the cost of service is higher in the boones," Sprecher said.

Ballard added that he was happy that the winning bid promises to provide ATM service within six months. The RFP had required ATM service only within two years of the contract award.

For states trying to attract new businesses, building a showpiece information highway is becoming a competitive necessity.

"When companies are looking at where to go, they're not just looking at water, transportation and power anymore. Telecommunications facilities are the new infrastructure issue," Dooley said.

Source of contention

"The state's networking business had been split up, but a consolidated network with guaranteed government traffic is a big chunk of business. So it is not surprising that the bidding process has become contentious," observed Milford H. Sprecher, an analyst who tracks the state government IS market for Federal Sources, Inc. in McLean, Va.
NWS Computer System Gets Chilly Review

A key $525 million computer system that's meant to serve as the nerve center of the National Weather Service's (NWS's) modernization has run into a storm of controversy on Capitol Hill. A new report by Congress's General Accounting Office (GAO) suggests that the system won't yield the payoff in better forecasting that NWS has promised.

The $4.5 billion NWS modernization, due to be completed in 1999, is supposed to use radar and satellite data to provide earlier, more accurate forecasts and severe weather warnings (Science, 15 October 1993, p. 331). The Advanced Weather Interactive Processing System (AWIPS), a high-speed network of workstations, will analyze these data and produce images for forecasters. But according to the GAO report, discussed in a hearing before a House subcommittee last week, NWS has failed to demonstrate that AWIPS's special capabilities will improve weather prediction.

For example, AWIPS can provide 3D displays, zoom in on storm images, and compose forecasts automatically. But GAO auditor Randy Hite says the office found "no objective evidence" that this gadgetry could help NWS make earlier forecasts and warnings. The GAO's Jack Brock also said AWIPS "runs the risk of spending more" than $525 million.

NWS Deputy Director Lou Boezi responds that it's simply not possible to demonstrate AWIPS's full capabilities years before the system is completely installed. However, James Baker, chief of the National Oceanic and Atmospheric Administration, NWS's parent agency, conceded before the subcommittee that "there is risk whenever you're trying to make a new system work."

Lawmakers urged the NWS to comply with the report's recommendations to eliminate AWIPS requirements that are unnecessary. NWS officials claimed that AWIPS's price tag is still accurate, but Baker added that the agency plans to begin assessing the program more critically.

Science

8 March 1996
Data centers feel White House pinch

By Gary H. Anthes
WASHINGTON.

The White House last week directed all executive branch agencies to consolidate small and midsize data processing centers into more efficient larger centers or outsource their operations entirely.

The Office of Management and Budget said it expects the large centers to operate 30% to 50% more efficiently and save the government some $500 million a year.

The government doesn’t keep a master list of its data centers, but a recent survey identified 205 centers employing 12,900 people and spending $2 billion a year. The number of centers could fall to between 40 and 60 under the White House plan, said John R. Ortega, director of the General Services Administration’s Federal Systems Management Center.

A budget office bulletin, issued last week, offered guidelines for the two-year consolidation effort. It said each IBM mainframe center should have a minimum of 325 MIPS of processing power on the premises, and it set similar floors for other kinds of environments.

Some agencies will have to scramble to meet the two-year schedule, and considerable personnel dislocations could result. Ortega said it wasn’t possible to say how many people would lose their jobs or be reassigned.

Ortega acknowledged the plan is getting a mixed reception among federal data center managers. “There are the people running large centers, and they see this as an opportunity to grow and modernize,” he said. “But if you are running a small center, obviously this is a stressful situation. Even if you know it to be good government, it’s still very painful.”

Some agencies are already well down the consolidation path. For example, NASA is already consolidating eight data centers into one.

The Department of Defense recently shrank its pool of data centers from 194 to 59 and plans to reduce that pool again to 16 megacenters.

The consolidations are based on an analysis that revealed large centers are much more efficient than small ones from a labor standpoint. For example, the centers averaging 36 MIPS in total mainframe processing power required almost one person per MIPS to run. However, centers averaging 767 MIPS could be run with just one-third of a full-time employee per MIPS.

But some observers said bigger is not always better. “There are some serious security risks to putting all your eggs in one basket,” said Robert Dornan, a senior vice president at Federal Sources, Inc. in McLean, Va. “And as you consolidate, the end user loses control. The farther away the resource is, the harder it is for the user to solve his problem.”

According to Ortega part of the consolidation plan is to modernize the large centers that remain. “We don’t want those centers to become dumping grounds for old iron,” he said. “And you need a very good physical plant because the government is risking more resources in fewer locations.”

The numbers tell the story on data consolidation

<table>
<thead>
<tr>
<th>TOTAL MIPS</th>
<th>NUMBER OF CENTERS</th>
<th>AVERAGE MIPS PER MACHINE</th>
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<th>FULL-TIME EMPLOYEES PER MIPS</th>
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Base: 74 federal centers with IBM mainframes and IBM compatibles

Source: Federal Systems Management Center, Falls Church, Va.
A major U.S. Army initiative to modernize thousands of aging computer systems has hit the skids, careening far beyond schedule and well over budget. The 10-year project, known as the Sustaining Base Information Services (SBIS) program, is supposed to replace some 3,700 automated applications by the year 2002. The current systems automate virtually every business function—from payroll and personnel management to budgeting and health care—at more than 380 installations worldwide. But after investing almost three years and about $158 million, the army has yet to receive a single replacement system.

The failure is significant not only because it strands the army with outdated software but also because SBIS is just one casualty among many. In January top Pentagon officials reportedly killed the larger Corporate Information Management (CIM) initiative, which for six years had tried to consolidate and modernize thousands of the armed services’ old and redundant computer systems.

The Pentagon has not been tracking either costs or savings of CIM. But the Department of Defense projected in 1992 that CIM would help it cut $36 billion by 1997. The General Accounting Office (GAO), in contrast, concluded last July that “Defense continues to spend about $3 billion annually to develop and modernize automated information systems with little demonstrable benefit. Few redundant systems have been eliminated, and significant savings have not yet materialized.”

WHISTLE-BLOWER
Russell D. Varnado is taking on IBM, Loral and the U.S. Army.

Why is one of the most technologically advanced organizations so consistently humbled in its attempts to master business software? A close look at the troubles of SBIS reveals that inadequate software technology, industry incompetence, a flawed procurement process and naive expectations all play a role.

The army conceived SBIS in 1992 to solve a long-festerering problem: most of the computer systems that the armed services rely on to raise, organize, train, equip, deploy and sustain their forces are growing obsolete. Designed 20 or more years ago to run on equally ancient mainframes, the systems are becoming prohibitively expensive to maintain. The antiquated programs typically cannot share information with one another, and many force the army to work in ways that no longer make sense.

SBIS was to replace 3,700 largely incompatible systems with about 1,500 new applications. The new systems would all run on the same kinds of computers and networks and would store data in compatible ways. By eliminating duplication, shutting down mainframes and allowing information to flow smoothly, billions would be saved.

And best of all, the systems would be based on the industry standards and
so would be cheap and easy to upgrade.

The army wisely decided to split its ambitious program into phases. The first contract called only for the common infrastructure and 89 applications, which would take three years to develop. In June 1993 a team of companies led by IBM Federal Systems (which was sold to Loral six months later) beat out several competitors for the contract with a bid of $474 million.

IBM’s winning proposal included techniques touted in the industry for their ability to make software development faster, less costly and less risky. Automated tools would boost programmer productivity. Designers would enlist users to help craft prototypes of the applications, so as to avoid expensive design changes later. Computer code already written for other systems would be reused.

Parts of the proposal should have raised questions, however. To back up claims that it could reuse more than 70 percent of existing code (about three times the industry average), IBM cited its work for the Federal Aviation Administration and Westpac Bank of Australia. But the FAA was forced to abandon much of IBM’s work, at a loss of nearly $1 billion. Westpac was likewise left with little to show for its nearly $150-million investment and dropped IBM, with some critics accusing IBM of promising technology it could not deliver.

IBM and its successor Loral again face that charge, this time made by a former army official. “IBM had a conflict of interest from the beginning” because it has lucrative contracts to keep the old mainframes running, says Russell D. Varnado, who managed information technology acquisition for the Army Material Command until 1992.

Last December Varnado and a small software firm called Pentagen Technologies filed a federal whistle-blower suit against IBM, Loral and the army officials who manage SBIS. The action accuses IBM and Loral of contracting to perform tasks that they knew were beyond their abilities; it also accuses army officials of failing to enforce the contract. IBM and Loral are fighting the suit.

The charges are based in part on a report filed by Charlotte J. Lakey, who managed the SBIS program from its inception until April 1994. The report describes how the project slipped behind schedule from the outset. “[Loral] missed most of their deliverables,” Lakey recalled in an interview, including “their system design plan, software de-

dvelopment plan, communications plans—basic things like that.”

Annoyed by the delays and alarmed when Loral proposed a software price that was “a lot higher” than expected, Lakey decided that the army should threaten to terminate the contract. But her superior overruled her, and several months later Lakey was removed from her post. In her final report, she suggested that “there needs to be a better contract mechanism... than hoping you get an honorable contractor.”

Although Colonel Charles Mudd, the current SBIS program manager, says Loral is using the promised state-of-the-art techniques and limiting systems designs to fit the budget, the estimated expense has skyrocketed. About $114 million of the $165 million set aside for software and services in the contract has already been obligated, even though no systems have been delivered (four are in testing). The latest estimate released by the army puts the life-cycle costs of SBIS’s first phase at $1.4 billion.

For its extra billion, the DOD now expects considerably less: the army has cut back the number of applications to be built from 89 to just 19 and the number of installation sites from 128 to 43. So rather than replacing 985 of the army’s 3,700 systems, this phase will apparently upgrade only about 180. Mudd attributes the reductions to budget cuts. But according to House Appropriations Committee staff, the SBIS budget increased 56 percent last year, from $62 million to $97 million. Mudd responds that he has been handed a “major budget cut” for next year. Paradoxically, cutting losses now could raise the price for SBIS, by prolonging the time until expensive old systems are replaced.

One lesson the DOD should learn from this experience—as it casts about for a strategy to replace CIM—is the virtue of patience, says Sanford F. Reigle, who has been investigating the initiative for the GAO. “It took them 30 years to get this screwed up,” he says. “We got there slowly, and we’ll get out of it slowly.” Indeed, in 1993, four days after William Perry, then deputy secretary of defense, ordered CIM to be accelerated so that all systems would be complete in three years, former director of defense information Paul Strassman objected in a memorandum to Perry. The DOD maintains some 11,000 major applications and perhaps 50,000 databases, he wrote: “The CIM goal to reverse engineer this inventory is 20 to 50 times bigger and twice as fast than anything ever attempted in the commercial sector. The DOD record to date in delivering on time even one million lines of code on schedule and on budget shows a 100% failure rate.” Strassman’s warning might have had more impact had he not resigned eight months earlier.

—W. Wayt Gibbs in San Francisco

Alarmed that 11 federal agencies now face computer projects headed for disaster, Congress opted for a radical solution. In January it fundamentally reformed the way the government acquires systems. Next month, an analysis of the new law’s chance of reducing costly software meltdowns.
Few IS projects come in on time, on budget

By Rosemary Cafasso

Application development projects are still the black eye of some information systems organizations: Nearly one-third of all projects fail and more than half come in over budget.

The good news is that more than half of the IS executives surveyed in a recent report said there are actually fewer failures today than there were five to 10 years ago.

These and other findings are part of a report, "The High Cost of Chaos," released last week by The Standish Group International, Inc. in Dennis, Mass.

The research firm recently surveyed 365 companies that together represent more than 8,000 development projects. According to those respondents, only 16% of all projects come in on time and on budget.

"This is disappointing and disturbing, but it is consistent with reality," said Jack Cooper, chief information officer at Joseph E. Seagram & Sons in New York, commenting on the survey results.

Also, the bigger the company, the bigger the problems, the Standish Group report said. It found that large corporations—defined as having more than $500 million in revenue—typically have lower-than-average success rates with development projects.

Coming in with a 9% success rate, large companies suffer from projects that are too large and have too many requirements to fulfill on a timely basis, the research firm said.

The Standish Group reported that in the average large corporate project, only 42% of the planned features and functions end up in the final version of the software.

Always late, always over

Some industry analysts suggest that some of the Standish Group results are too conservative and the percentages of cost overruns in particular are likely higher.

"Year to year, you would hope the percentages would go down, but projects are always late and over budget," said Ed Acelly, an analyst at International Data Corp. in Framingham, Mass.

The Standish Group reported that one reason projects still fail is because IS typically sweeps disasters under the rug instead of learning from them.

"With all the methodologies and software engineering and so forth, we still don't know why they fail," said Standish Group Chairman James H. Johnson.

Cooper said he suspects projects founder because all the new technologies and design tools cannot take away this basic fact: The essence of a development project is turning abstract concepts into working products.

"Creation and construction are always difficult," Cooper said. "There is no magical solution."
IRS CIO: Agency will consider outsourcing

By Sharon Machlis

IRS chief information officer Arthur Gross last week told a congressional hearing that the agency — after years of unrelenting criticism — is examining options for outsourcing tax return data processing. That move is likely to encounter even more criticism from privacy advocates worried about sending sensitive taxpayer information outside the government.

To date, the Internal Revenue Service has spent $4 billion on modernizing the agency's beleaguered information technology systems. Even so, "The Tax Systems Modernization program has been a complete disaster," said Rep. Rob Portman (R-Ohio), co-chairman of the National Commission on Restructuring the IRS. "Clearly, the IRS needs outside help to get the modernization job done."

Toward that end, IRS documents given to Computerworld indicated a two-tier proposal:

- Near-term replacement of the aging manual data entry system.
- Longer-term pursuit of outsourcing and the deployment of imaging and other advance technologies.

The proposal notes that "...the IRS must end its dependence on antiquated technology and an increasingly scarce seasonal workforce as well as expand its electronic commerce programs."

Also in the short term, a report issued last month by the General Accounting Office urged the IRS to examine alternate ways of processing tax forms such as the 941 before enlarging the use of the Service Center Recognition/Image Processing System (SCRIPS). IRS officials said they will complete a cost/benefit analysis by the end of the fiscal year.

IRS officials last week declined to comment on the GAO report and said officials were unavailable to comment on Gross' testimony.

But in the agency's formal response to the GAO report, officials agreed to conduct tests to ensure SCRIPS can meet peak production loads in the future.

New scanners are planned to solve jamming problems.

In its report, the GAO said the 2-year-old SCRIPS computerized imaging system performed "significantly better" last year than in 1995, but it still failed to deliver on many of its promised benefits.

Yet the cost for SCRIPS continues to climb, while labor savings remain less than expected.

Installed in late 1994, SCRIPS is still being modified. It scans tax forms and uses optical character recognition (OCR) to turn them into computer-readable data. It was supposed to boost productivity 20% over manual data entry and 10% vs. older OCR equipment. But in 1995, it actually processed one type of form, the 1040EZ, 7% slower than when done by hand.

PROBLEMS FROM THE START

SCRIPS has been dogged by problems since its inception. Those included scanners that jammed when processing returns on thin paper and system software that wasn't fast enough to keep up with the hardware. Instead of the planned 25.6 staff years to process the bulk of the 1040EZ forms in 1995, 66.5 staff years were needed.

On the plus side, SCRIPS suffered substantially less downtime — 43 hours in last year's second quarter vs. 791 hours in 1995 — while processing 1040EZ forms about 6% faster. But it handled only about half of those forms; it was supposed to process all of them. It also wasn't used for any 941 or 1040PC forms, although plans called for it to process 93% and 50% respectively by last year.

GAO officials said a decision to move form processing from 10 centers to five essentially doubled the workload of each SCRIPS system without adequate redesign. Modifications were made last year but haven't been fully tested.

The GAO pegged the latest overall SCRIPS price tag at $288 million; previous estimates ranged from $133 million to $209 million. Some of the increase was caused by at least $20 million in unbudgeted maintenance costs, according to the GAO.

Many of the problems that plagued SCRIPS in 1995 could have been avoided if the IRS had conducted a better pilot test, including an examination of all software applications and the system's ability to handle peak tax season processing loads, according to the GAO report.
PC support costs bedevil IS

By Bob Francis

Frustrated by the cost of supporting desktop PCs, some information systems managers are taking a look at network computing devices as an alternative.

These devices don’t seem to be affecting PC sales, but some managers are using them in place of PCs on their networks, citing lower support costs as a primary factor.

“We can use these devices for a variety of applications on the network, and yet we don’t have the support costs associated with PCs,” said Manual Roy, an IS manager at Blue Cross/Blue Shield of Florida in Miami.

Reasons to switch
Roy cited the fact that these systems can handle legacy and PC applications and still be controlled from a central server as primary reasons for using the 100 or so network computing devices from HDS Network System, Inc. in King of Prussia, Pa.

“With PCs, we have to go out to the system to make a lot of the changes,” he said.

Last week, IBM got in the network computing device game, announcing a product designed for its AS/400 systems (see story above).

IS managers have struggled to get PC costs under control for some time. “From where I sit, the actual hardware isn’t the big cost of the PC — it’s getting someone to set it up and configure it and make sure it’s operating right,” said James McCullough, MIS director at Delta Air Lines in Atlanta.

In response, the PC vendors are planning a frontal assault on PC management costs, led by the industry’s primary chip manufacturer, Intel Corp. in Santa Clara, Calif.

Intel, which has become the primary motherboard vendor to the PC industry, plans to incorporate several new monitoring and management features on future generations of its motherboards.

Motherboards are the basic building blocks of desktop PCs, housing the microprocessor and connections for the hard drive, memory and add-in cards.

Intel’s counterattack
This week, Intel will announce a product that will be incorporated into LANdesk, its desktop PC management software. Scheduled for release later this year, the configuration management technology will allow IS managers to perform PC installation, configuration and upgrades over the network, even if the PC has been turned off.

This new capability should help lower the cost of PC management because most IS managers have to deploy personnel to perform these tasks on-site.

“If IS managers can do some of these tasks centrally, it should help lower their costs,” said Brian Burba, an analyst at International Data Corp. in Framingham, Mass.

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**Soft PC costs**

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<tr>
<td>Configuration</td>
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<tr>
<td>Software upgrades</td>
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<td>Local and remote PC support</td>
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**Five-year cost of managing**

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<td>Network computing device</td>
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Source: Gartner Group, Inc., Zona Research, Inc. and HDS Network Systems, Inc.

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**Firstforay**

Compaq Computer Corp. first added sophisticated management features to desktop PCs in March 1995.

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**PC Costs**

The hardware of a PC usually costs about $2500 and the software adds a few hundred dollars more. It probably should be replaced with a new computer in about three years.

- So the cost is only about $6000 for six years.
- A typical big shop pays about $40,000 each five years for each PC. There is a big debate about why it costs so "!!"#! much to service the PCs.
Agency eyes data center consolidation

By Brad Bass

WASHINGTON

General Services administrator Roger Johnson said his agency will consolidate its 22 internal data centers into two. This move is in response to an analysis that showed the General Services Administration (GSA) pays 2½ times more for processing than private organizations commonly pay for the same amount of work.

Johnson said he is not yet prepared to decide whether to outsource the data centers or allow other agencies to handle the functions.

Johnson commissioned the analysis, which was conducted by GSA personnel with the help of auditors from Arthur Andersen & Co., to ascertain which, if any, GSA functions could be performed more effectively and less expensively outside the agency.

Johnson said GSA personnel must an-

alyze the findings further to pinpoint why the agency pays more than its private counterparts. Meanwhile, the consolidation and other actions can lower costs in the short term, he said. "We're continuing to look at the implications of contracting it out," he said.

Julia Stasch, the GSA's deputy administrator, said a decision will also hinge on GSA analyses of the other aspects of the agency's operations, which are scheduled to be covered by Arthur Andersen. Because the data centers support a range of agency activities, those analyses will help determine whether the data centers will remain in-house, Stasch said.

Data centers and the agency's Public Building Service were the first areas analyzed as part of Johnson's comprehensive search for ways to downsize the agency.

Donald Venneberg, the GSA's deputy chief information officer, said the total annual cost per MIPS at GSA's data centers was $172,669, compared with an average of $59,000 in private industry.

"We're about 2½ times less efficient against this benchmark," Venneberg said. "This naturally caused us some concern. We discovered some things we ought to do now to improve our internal situation."

Money-saving plan

According to the analysis, the agency would save $1 million a year by closing smaller data centers that run below 400 MIPS. By merging the remaining centers into sites at Kansas City, Mo., and Fort Worth, Texas, the agency would save another $4.2 million a year.

Venneberg said no timetable has been set for the consolidation, but a plan is due by the end of next month.

"All of the machines don't get utilized as efficiently at smaller data centers," Johnson said. The consolidation will lead to reduced rent payments and less money spent on equipment, personnel and contractors, he added.

The agency has also begun replacing old Bull HN Information Systems, Inc. equipment, which has become costly to maintain, with equipment provided by Unisys Corp. Venneberg said the GSA will eliminate the Bull machines by the end of this fiscal year, saving the agency another $11.3 million a year.

Venneberg said more savings will accrue when a maintenance support contract with Infonet Services Corp. expires in December 1996 and a similar contract with Martin Marietta Corp. lapses a year or two later.

The agency may then move applications from legacy systems running proprietary code into a client/server architecture, Venneberg said.

Bass writes for Federal Computer Week, an IDG publication.
Some more articles follow:

1. Federal aviation.
   a. Lessons From the FAA's Costly Bid To Upgrade Air Traffic Control
   b. Air Traffic Control System Running Aground

2. Defense Department
   a. Army Changes Client/Server Attack
   b. Defense Department Reconsiders Ada mandate
Lessons From The FAA’s Costly Bid To Upgrade Air Traffic Control

Second of two parts

By Brian Deagon
Investor’s Business Daily

The Federal Aviation Administration’s overhaul of the nation’s air traffic control system — six years behind schedule and $2.1 billion over budget — has been victimized by mistakes common to major technology projects.

The sheer size alone of the $7 billion project meant it had only a 50% chance of success.

Computers & Automation

“The larger and longer the project,” said consultant Gary Curtis, of the Boston Consulting Group, “the more likely it will take even longer to finish and cost more than estimated, or even work at all.”

When International Business Machines Corp. won the primary contract to develop and produce the system, after a four-year competition with Hughes Aircraft Co., the FAA estimated completion by 1998. Now, it’s at 2003.

Loral Corp. took control of the project early this year when it acquired IBM’s Federal Systems Co.

According to John Singel, a technology expert for the Price Waterhouse accounting firm, the air traffic control project is guilty of several “deadly sins” that cause large information technology projects to go awry.

At the top of the list is “scope creep,” the continuous redefining and expansion of a project until it begins to collapse from its own weight.

Said Rep. Jim Oberstar, D.-Minn., who chaired an aviation subcommittee hearing on the FAA project last week: “A year ago, I said we have to nail these people’s shoes in place and keep them from making more changes.”

Observers cite several reasons why the FAA has continually expanded the project.

Long Life Expectancy

Officials wanted the new system to last more than 20 years. But it was initially designed in the early 1980s. And when it came time to actually build the system in 1988, much of the technology was obsolete.

“The FAA required such high-performance stuff that we had to stretch the envelope and build something that had never been built before,” said Unisys Vice President William Marberg, who worked on the project in 1984 while at Hughes.

Freezing the requirements was practically impossible. Computer processing power more than tripled from the early design phase to the actual project launch. The decision to upgrade with powerful new technology forced the numerous redesigns.

“They undertook this project in a period of unprecedented technological change,” said Singel of Price Waterhouse. “They could hardly have picked a more difficult time.”

The desire for the best technology made the FAA guilty of another deadly sin. Officials pushed the technology too hard and too fast and tried to accomplish feats never before attempted.

For example, the agency specified the system’s software be based on a language called Ada. The Ada language is standard within the Department of Defense and is well-suited for mission-critical battle systems. But it’s never been used in a commercial system this large.

“The learning curve was very steep on Ada,” said Marberg, “and the tool sets available to us were not as good, so that caused a delay.”

The new air traffic control software ranks among the most complex in the world. Hundreds of functions must be executed within seconds, and the system must recover from equipment failure without losing any data.

On average, every line of software code for the project has been rewritten at least once, compared with a normal rewrite rate of four in 10. As of last month, IBM reported 2,100 trouble reports, of which 800 were categorized as high priority, meaning they should be resolved before formal testing.

The bidding process created other problems.

To keep the bidding fair, the FAA limited the discussions IBM and Hughes could conduct with air traffic controllers. As a result, it was impossible to know what features they felt were needed in the user interface. The changes that were later made to the user interface, such as controller screen formats, created further delays.

Moreover, Hughes sued the government after IBM was awarded the primary contract, claiming the process was unfair. The lawsuit froze work for four months.

“Had there been no protest,” said Marberg, “the project would have run smoother.”

Four years into the project, the FAA still hadn’t decided how many air traffic control facilities would be upgraded or consolidated. It has only recently begun to analyze the need for space at towers, which may need to be expanded or refurbished.

The user interface is still being refined. For example, there is a concern the time needed to enter data into terminals may require controllers to divert their gaze from radar displays for unacceptably long periods.

Other problems associated with the project can be loosely classified as typical of government.

Ballooning Costs

The FAA’s estimates of $2.5 billion in 1983 grew to $4.8 billion by the time the contract with IBM was signed in 1988, and later ballooned to $5.1 billion. An Inspector General report found that IBM’s price estimates could not be relied upon to establish good contract management and auditing.

Moreover, not enough time was allowed for design, development and testing. The unrealistic schedules put pressure on the FAA to compress testing and defer the software development until after production decisions had been made.

Said Ed Acy, director of software research at International Data Corp.: “A very common mistake made in large projects like these is that organizations don’t spend enough time up front to really understand what the requirements are, scope them out, and then determine if they have a solid understanding of what they are trying to automate.”
Air traffic control system running aground

The FAA scraps major portions of its $7 billion modernization project; flight delays may increase

By Gary H. Anthes
WASHINGTON

The troubled effort to overhaul the nation’s air traffic control system has been drastically scaled back, with the Federal Aviation Administration recently canceling two of the five major system components and trimming a third from its Advanced Automation System (AAS) project.

The moves are intended to stem the tidal wave of red ink from a project that was estimated in 1988 to cost $2.6 billion but is now pegged to balloon to nearly $7 billion.

Air traffic controllers — the eventual users of the new systems — said they will not let safety suffer as a result of the cutbacks. Yet the controllers may be forced to resolve system overloads, an increasingly common event, by increasing flight delays, said Will Faville, director of safety and technology at the National Air Traffic Controllers Association, the labor union for 15,000 U.S. controllers.

The FAA on June 3 grounded the $1 billion Area Control Computer Complex, which was intended to combine two separate systems used to control aircraft near airports and en route between airports. Its objectives can be better met by yet another system — intended to generate conflict-free routes between departure and arrival airports — already under separate development, the agency said.

The FAA also canceled the $650 million Terminal Advanced Automation System, which was to have replaced hardware and software at facilities that control aircraft within 20 to 30 miles of airports. Instead, an existing system augmented by technology outside the AAS contract will be used.

Change of plans

The FAA also said it will replace workstations, servers and radar screens in towers at only the 70 largest airports, rather than at 150 airports as was originally planned.

Finally, the FAA said it will take an additional 90 to 120 days to review software developed by IBM Federal Systems Co. — which Loral Corp. has since bought — to determine whether it can be salvaged for the Initial Sector Suite System (ISSS). The ISSS is one of the five major components of the AAS and is the one that would replace systems that guide aircraft en route between airports.

In a letter to House Aviation Subcommittee Chairman James L. Oberstar (D-Minn.), FAA administrator David R. Hinson cited a recent study that concluded, “The current software architecture and design for key elements of [the ISSS] is outdated and flawed in many areas, and it is not known whether the software can be made to work at a reasonable cost and schedule.”

If the ISSS software does not pass muster, the FAA may have to write off the $1.4 billion it has spent on the software since 1989, Hinson said.

“We are not surprised by these decisions,” said Allen Li, associate director of transportation issues at the U.S. General Accounting Office. He said it was “prudent” to do the software audit, citing differences of opinions among parties that have probed the ISSS project.

COMPUTERWORLD JUNE 13, 1994
Army changes client/server attack

By Gary H. Anthes

Sixty thousand diskless workstations, 10,000 Unix servers, 2 million lines of Ada code and multilevel security. It seemed like a good idea at the time.

But that was then — 1990 — and this is $500 million later, and the $1.8 billion project to set up the world's largest client/server system for the Army National Guard and Army Reserve recently completed a major course correction.

The diskless X Window System terminals became full-fledged PCs, Unix gave way to Microsoft Corp.'s Windows NT, custom Ada bowed to shrink-wrapped software and the elaborate security was canceled due to lack of interest.

The changes — plus earlier delays, pushed final implementation of the Reserve Component Automation System (RCAS) out to 2002, eight years later than planned. RCAS managers hope that cost savings from the restructured program will still allow the Army to complete the program within the original cost estimate.

Meanwhile, the two auxiliary forces' users march on with a hodgepodge of unintegrated systems and manual procedures. "I think we all get frustrated, working for a big employer like this," said Lt. Col. Steven Abel, director of information management at the Oregon Army National Guard in Salem. "But you never give up hope; you know it's going to come sooner or later."

The restructuring of RCAS is in part the result of rapid changes in technology, which made 1990 assumptions increasingly obsolete as the huge project crept forward. Another issue was the apparent failure of program managers to get enough user input early on.

RCAS is intended to support the day-to-day activities of 10,500 Guard and Reserve units at 4,000 sites in 11 functional areas such as logistics, finance and training. It is also intended to enable the rapid mobilization of forces during wartime.

The custom Ada code was needed largely to satisfy very complex multilevel security requirements. Databases were to have held a combination of unclassified, confidential and secret data, with the operating system permitting access to just the data for which an individual user was cleared.

But it turned out that little RCAS data is classified, so multilevel database security was scrapped in favor of point-to-point encryption using the government's PCMCIA cards.

Meanwhile, users already accustomed to Windows-based PCs said "no way" to the unfamiliar Unix operating system and the limited diskless workstations. The revised system is "not some arcane system that is different from ones the soldier uses at work or at home," said Maj. Rusty Lingenfelter, director of information management at the Iowa Army National Guard in Johnston. "So they can come in on weekends and sit down to something that is familiar."

Despite the delays and changes, beta testers with the first few pieces of RCAS say they are bullish on the project. The Iowa National Guard is one such beta site. Capt. Allen Meyer, a personnel officer, said electronic mail with an electronic forms option has already streamlined operations and improved communications among Guard units in the state.
Defense Department reconsiders Ada mandate

By Gary H. Anthes
WASHINGTON

Prompted by a blue-ribbon panel of software experts, the U.S. Department of Defense may be ready at last to back away from its decade-long insistence that all new systems be coded in the Ada programming language.

A committee of the National Research Council (NRC) in Washington said the Pentagon should strengthen its commitment to Ada for "war-fighting" systems but consider other languages for down-to-earth applications.

Web server — or any client/server system — the critical feature is that they interact through certain protocols," said William Scherlis, an NRC committee member and a computer scientist at Carnegie-Mellon University in Pittsburgh. "Implementation languages don't matter."

**The ultimate language**

But in the 1970s, they did matter. Burdened with systems written in 450 languages, the Pentagon designed Ada as the programming language to end all programming languages. In 1987, it mandated Ada for all software development, and now some 50 million lines of Ada software are used in the Defense Department.

The rich and powerful language was designed to accompany modern software engineering practices, thereby leading to increased programming productivity and more error-free and reusable code.

For that reason, Ada will remain a niche player in the nonmilitary world, relegated to use in "high assurance," real-time systems, Scherlis said.

"Ada unequivocally gives you advantages in reliability," said Barry Boehm, chairman of the committee that drafted the report and director of the Center for Software Engineering at the University of Southern California in Los Angeles.

For systems that require real-time processing and high reliability, such as software that guides a missile, Ada is the best language to use, Boehm said.

**Computerworld** Nov 11, 1996
Plans for New Computer Systems
How good are they?

All systems not go

IT'S LATE, COSTLY, INCOMPETENT
—BUT TRY FIRING A COMPUTER SYSTEM

A 15-year, $8 billion project?
It's a Titanic with at least three icebergs in its path.

It's a brand-new ball game as business workers fill IS jobs

GAO report slams fed's IT spending

The IRS's doomed cure-all
Business, IT wires crossed

FOR YEARS, pundits have admonished IT workers to get more in tune with the business needs of their companies. But that's still easier said than done.

Despite all the encouragement, mixing the business and information technology worlds often is like trying to mix oil and water, said a half-dozen attendees at a conference held here this month by Meta Group, Inc. in Stamford, Conn.

Just ask Mercedes Johnson, a principal business analyst in the fuel procurement department at The Detroit Edison Co. Johnson wants to work with her information systems counterparts to develop new applications that the utility needs to compete under upcoming deregulation measures.

"As a business unit, we have our own ideas of what we want to do, and IS often has its own way of doing things. It's something that we've been struggling with for a while," Johnson said.

She said she had traveled to the technology conference to help in this effort, "so I can talk to the IS people in more depth."

Several technology managers said their IS staffs also are struggling to adopt a more business-driven mentality.

"Getting technology people to be customer-oriented is not easy," said Rod Calacci, central computing manager at Sundstrand Corp.'s aerospace unit in Rockford, Ill. "I work on them every day. Some will change, some won't."

To help prod IS employees to put the needs of users ahead of technology for its own sake, Sundstrand is looking at melding its "silos" technical functions such as application development and

**CONTINUED FROM PAGE 39**

technical support into a more unified and service-based organization, Calacci said.

The $1 billion aerospace operation, which makes products such as fuel pumps and power generators, also plans to create five new internal marketing and user liaison jobs within IS. Their main duties will be to keep close tabs on business units and "help with the translation between technical and nontechnical people," Calacci said.

Michael Merritt, chief information officer at Primestar Partners L.P., established the same sort of liaisons after joining the Philadelphia-based satellite TV company last year.

"They're our eyes and ears in the business, and they try to be the same for the business into us," he said.

**MIXED GROUP**

Four of the five jobs were filled with people from the business side, added Merritt, who also set up a technology strategy group that meets monthly and has a mixed membership of business and IS managers.

Technology investments "should be looked at the same way as building a new distribution or manufacturing plant would be," said Donald Faistl, director of technology infrastructure and communications at International Flavors & Fragrances, Inc. in Union Beach, N.J.

But too often, he added, IS workers zero in on a technology with no particular business goal in mind.

International Flavors & Fragrances, a $1.5 billion manufacturer, is trying to change that mind-set through coaching, increased interaction with business units and outside courses and conferences in verbal and written communications. "I wouldn't say we're fully there, but we've started the process," Faistl said.

The same is true at Detroit Edison, Johnson said. The utility formed a business/IT strategy team that put together a plan for the new procurement applications.

"I think we're making inroads now," she said. "We've opened the lines of communication."
It's a brand-new ball game as business workers fill IS jobs

By Randy Weston
and Craig Stedman

BRAD WAGNER is a mechanical engineer. Michael Cromar is a certified public accountant. And Jim Davis is a strategic business planner.

But today, they find themselves playing the role of information systems manager.

The new breed of IS professionals, people from the business side who land jobs directing information technology projects and balancing the often conflicting demands of technology and business needs.

For Wagner, it meant leading a product data management implementation at Trek Bicycle Corp. in Waterloo, Wis. He teamed with systems analyst Kevin Clayton, an IS professional who has an engineering background.

"I defined the business problems, [and Clayton] modeled them within the computer system," said Wagner, product engineering manager at Trek. "This allowed him to focus on technology and me to focus on solving the problems."

Wagner said by teaming to work on problems, the lines of communication were very short between what business problems needed to be solved and the technical solutions offered.

"I learned a lot about the roles of different IS people," Wagner said. "Right now, Kevin plays the role of analyst and programmer. In an ideal situation, I would have had an analyst, programmer, and someone to do all the training. In reality, there was the two of us."

Wagner is getting ready to turn over control completely to Clayton, who will continue to enhance, maintain and support the system as part of the engineering department.

According to Charles Lybrook, executive director of the Atlanta-based Information Management Forum, one of the factors for successfully managing IS projects is making sure both sides clearly understand the technical and business objectives (see chart, upper right).

"You create an environment so that everyone has respect for what the other person brings to the table," Lybrook said.

At Nibco, Inc., a recent SAP AG R/3 rollout was jointly led by two business executives and the Elkhart, Ind., manufacturer's IS director. "There was a lot of disagreement," said Jim Davis, one of the business executives. "But there was a commitment to making consensus decisions."

The three regularly used facilitation techniques to settle any differences (see story, page 35).

Michael Cromar, chief financial officer at equipment leasing company GATX Capital Corp. in San Francisco, also recommends making the implementation team a separate entity to foster a sense of comradery and help tear down any walls between IS and business departments. When team members work near one another, they take on a single identity with a common purpose.

PSEUDO-CIO

Cromar is a CPA turned pseudo-chief information officer and has spent much of his career automating the financial systems of his employers. He currently is heading up a massive implementation of R/3 at GATX, which includes rewriting much of the software to fit the unique needs of the leasing management industry.

"You create an environment so that everyone has respect for what the other person brings to the table."

- Charles Lybrook,
Information Management Forum

Nearly half of the 22 members in the implementation group on GATX's project are businesspeople.

All were eventually pulled onto the project full-time while their jobs were filled with other employees.

From IS, Cromar grabbed mainly systems analysts who were already resident in business departments and who on a daily basis translated business needs into code.

He recommends staffing the team with businesspeople who are comfortable with technology and technologists who are comfortable with business issues.

"One thing I have learned in managing technology projects is certain people have an affinity for applying technology to business problems," Cromar said.

"They get satisfaction out of making technology do what they want and get a charge out of that rather than technology itself," Cromar said. □

Computer World
April 6, 1978
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We need to pull people from the business side to make it work.

A different type of project requires a different type of worker

Staffing intradepartmental projects isn’t always easy. After studying SAP R/3 and what the critical success factors were with enterprise resource planning (ERP) systems in general, it became clear to GATX CFO Michael Cromar that the degree of integration and depth of the software required a different type of staffing.

“I had to convince management we needed to pull people from the business side to make it work,” Cromar said.

The business users pulled included the director of taxation, two of the highest level portfolio management directors, the manager of financial reporting, an accounting manager and a lease contract administrator.

Half of those people will now stay in IS, supporting the new system and helping with the rollout of additional R/3 modules.

Similarly, 20 of the 27 employees who worked on Nibco’s R/3 rollout came from the business side of the manufacturer. And two members of a three-person team that jointly managed the project were business executives.

The 20 businesspeople were assigned to the R/3 project full-time for more than a year and moved to a separate office area along with their IS cohorts.

Several of them have remained on a smaller 11-member team that is doing R/3-related support work, even though that group is now part of the company’s IS department.

It doesn’t hurt to have a little old-fashioned clout when trying to staff up.

Gene Elmore’s last job at Lockheed Martin Corp. was managing the development and manufacture of the company’s new F-22 Raptor fighter plane. But six months ago, he was tapped by the president of Lockheed Martin’s Aeronautics Sector to head up a $100 million R/3 implementation and business re-engineering project.

Elmore, who is now vice president of ERP at the Bethesda, Md., division and reports directly to the president, said he was given the authority to be a “visionary with power.”

He surrounded an IT infrastructure group working on the R/3 project with eight other groups focused on business issues and then made sure the business managers called all the shots.

“We love IS, but they’re just part of the team,” Elmore said. “They don’t decide anything about the [business] process changes. They’re into implementation.”

— Randy Weston and Craig Stedman
The desktop disconnect

ITEM: A Computerworld survey of 150 IS managers found that speed and price were the least important improvements they wanted to see in next-generation desktops. Tops on the wish list: Reliability, ease of administration and ease of software management.

ITEM: The average life cycle of a new PC has fallen to about six months, as faster chips and lower prices quickly render existing inventories obsolete.

So let's get this straight:

Users are asking for lower cost of ownership. Vendors are responding with faster chips.

Users are asking for stability. Vendors are giving them more complex hardware and software.

Users are asking for maintainability. Vendors are giving them lower hardware prices.

Talk about a disconnect.

The time is overdue to simplify the PC. The thing has become too damned complex, unreliable and overpowered. The computer industry is selling Ferraris to people who should be driving Corollas. And every year the industry tells them they need a new model. It's crazy.

PC makers know how to sell two things well: speed and price. But bigger disks and 300-Mbyte office suites are the last thing people-strapped IS support organizations need. Think of how often your Windows 95 crashes in a typical week. It's no wonder two of the top 10 selling software products last year were packages that fixed problems caused by other software. Ask yourself if your mother could install and use Lotus Notes without a daylong training course. No wonder computer training is a $3 billion industry.

Don't get me wrong: I love PCs. I've owned them since 1984 and love to tinker with them in my spare time. But like most people, I have a job to do, and the value of the desktop mainframe I use at work has become questionable.

An IS specialist at Computerworld recently spent dozens of hours upgrading me from a 166-MHz laptop to a 233-MHz laptop. Then I spent a Saturday afternoon on my own reinstalling software and tidying up.

The upshot is that I have a brand-new PC that isn't discernably faster than the old one. It's a nice system, but is it helping me work harder or more productively? No.

Then every week or two I pack about 12 pounds of PC technology in my briefcase and lug it to the airport. I will carry this cinder block around my neck for a few days simply so I can get at my E-mail. This is technology overkill to the max. Future generations will look back on this inanity and wonder why we put up with it. Come to think of it, why do we put up with it?

That's what this special report is all about. The desktop computer is one of the great innovations of the past 20 years, but it is still an outcast in the complex, integrated information systems that corporations are trying to build today.

It was frustration with the PC that engendered the whole network computer movement. The hype has died down for now, but the user outrage that sparked the network computer movement is very real. PC makers and software companies are, belatedly, trying to respond to customer concerns by building management features in

sent a host of new management problems as critical corporate data gets dispersed into computers that easily can be left in a pants pocket at the dry cleaner.

On the other hand, network computers are going to take off. No, not the fancied-up terminals envisioned by some early supporters. The network computer will be a tapestry of special-function devices that connect to an IP-based network: telephones, pagers, terminals, appliances and yes, even low-cost PCs. These machines won't bear the NC name, but they'll do what business users and IT professionals alike want to do: provide easy access to information that makes us more productive.

And isn't that what it's all about?

Paul Gillin, Editor
Internet: paul_gillin@cw.com

May 4, 1998

Computerworld
Oh, I wish I had a better invoice system

Oscar Mayer parent saves by automating taxes, other processes

By Barb Cole-Gomolski

Kraft Foods, Inc. has a recipe for processing invoices that is expected to save the company $3 million over the next three years. The food conglomerate, which includes the Kraft, General Foods and Oscar Mayer brands, has deployed the application to about 70 users to handle accounts payable.

In the process, it reduced the costs associated with paying an invoice from more than $7 to about $4. Productivity is up by 30%, and customer service calls are answered in three minutes instead of 15.

Workflow systems were designed to improve productivity by eliminating paper, cutting out unnecessary steps and routing high-priority tasks to certain workers.

But Kraft's project has succeeded because it ties in related business processes — such as signature validation.

Kraft's Bernie Kocanda: The company sped up its accounts payable while cutting costs

Kraft automates invoices

Continued from page 53

Software

tion, audit control and tax compliance — that once slowed down accounts payable, company officials said.

Connie Moore, an analyst at Giga Information Group in Norwell, Mass., said the project isn't a typical accounts payable application.

Giga recently gave Kraft an excellence award for the application at Giga's Business Processes and Knowledge Management conference.

TAX TABLES

"They've extended [the application] to other business processes," Moore said.

For example, the system automatically calculates and adjusts taxes according to a table maintained by the tax department, said Bernie Kocanda, director of the Kraft Foods Shared Services Center in San Antonio.

In the past, tax experts often would be asked to manually calculate taxes, which slowed things down.

Workflow functions also let Kraft prioritize invoices based on due dates, Kocanda said.

Traditionally, invoices would pile up for entry into one of the company's three legacy accounts payable systems.

"Once [the invoices] were in there, you may not know which ones are a priority," he said.

And paying bills according to their due dates allows Kraft to negotiate better deals with suppliers, Kocanda said.

The workflow system also makes the rules for processing invoices more uniform, said Yolanda Freeelon, an accounts payable associate at Kraft.

"If all the information needed to process an invoice is not there, the system kicks it out as an error, and we are able to reject that invoice back to the requester," Freeelon said.

The system automatically prints a copy of the invoice and a letter that lists what errors need to be corrected before that invoice can be paid, she explained.

"From a control standpoint, we were able to apply consistent approval [rules] that we couldn't do before," said John Helmerci, Kraft's director of finance and human resources systems.

The application "has given me the ability to track the invoices received through the entire process, especially those that are problematic," said Robin Mask, an accounts payable associate at Kraft.

"Research on possible duplicates, old invoices and problem invoices is done at my desk instead of digging through rows and rows of file cabinets," she said. ☐
GAO report slams fed’s IT spending

By Patrick Thibodeau

THE U.S. GOVERNMENT’S investments in information technology have often failed to deliver better services at lower cost, the General Accounting Office says in a new report.

During the past six years, U.S. agencies have spent $1.45 billion to develop and maintain systems that promised to give agencies the ability to re-engineer businesses processes to improve operations. But the results “have often been disappointing,” according to the report.

“Failure of any one of these efforts would represent a double loss: first, a loss of investment capital spent in developing the system; second, an opportunity cost by not achieving the desired improvement in operational efficiency or mission capability,” the GAO said.

The GAO singles out, in particular, the efforts of the Internal Revenue Service and the Federal Aviation Administration, whose much criticized systems efforts are considered at “high risk.”

SLAMS APLENTY
Other projects on that list include the U.S. Department of Defense’s corporate information management initiative and the National Weather Service’s modernization project. But the GAO also slams a long list of other federal computer projects, such as a $2.6 billion project by the U.S. Department of Agriculture (USDA).

The USDA has been developing a network of 2,500 “one-stop” service centers. But the GAO said the project is being managed as a vehicle for acquiring new technology, rather than as a true opportunity to better serve farm customers.

Complicating this is the year 2000 problem, which is taking precedence in funding, the GAO said. The White House Office of Management and Budget “is now presuming that information technology investments would not be funded for the next fiscal year unless they are directly related to fixing the year 2000 problem,” the report said.

Many federal agencies “are having real difficulties” getting year 2000 repairs done in time, the GAO said.

1. Some trouble areas:

a. The Defense Corporate information management initiative
b. National Weather Service modernization project
c. The $2.6 billion project by USDA
d. The FAA system (high risk)
e. The IRS plans (high risk)
f. The NASA EOSDIS system (not listed above)
g. Other systems

2. What are the results of Agency data efforts?

- GAO says: “the results are often disappointing.”
Data glitches delay observation satellite

[WASHINGTON] Software problems will delay the long-awaited launch of the first major satellite in the US space agency NASA’s Earth Observing System (EOS), a network of at least three large spacecraft and many smaller ones designed to study the Earth as an integrated system.

The AM-1 spacecraft — which carries US, Japanese and Canadian sensors for monitoring clouds, ice, land and water — was to have been launched in June, but will now remain grounded until at least December.

The problem is with a segment of the troubled EOS data system known as the EOSDIS, one of the most complex software engineering projects ever attempted. The $2 billion EOSDIS is designed to handle unprecedented volumes of data from a variety of orbiting sensors over a decade or more, and to format the data for a wide range of users, from scientists to the general public.

Although the system passed an important test of its science data processing segment last summer (see Nature 389, 108; 1997), other difficulties have continued. One problem area is the software’s Flight Operations Segment (FOS), designed to control and monitor the health of all EOS spacecraft and to schedule onboard activities such as instrument pointing.

NASA had hoped that bugs in earlier versions of the FOS would be corrected in a new version which was delivered last month by the Lockheed Martin Corporation. But some of the old problems remain, and new ones have appeared, according to EOSDIS project manager Rick Obenschain of the NASA Goddard Space Flight Center in Maryland.

If the FOS cannot be fixed in time for the AM-1 launch, the space agency is considering adapting commercially available software similar to that used for the recently launched Tropical Rainfall Measuring Mission and the forthcoming Landsat 7 — which also has slipped from a July launch to at least February, due to a power supply problem with its main instrument.

Any off-the-shelf alternative would not be a full replacement for the FOS, says Obenschain, and would be a one-time-only fix. It is also unlikely that it would be ready by December, he says.

The EOSDIS is “meant to be everything to everybody”, he says, which may be its biggest problem. In retrospect, says Obenschain, it was “probably not a very good intent” to design a single, massive data system to handle all the needs of all EOS spacecraft (more than two million lines of computer code have been written already).

The project has suffered major delays, attrition rates as high as 38 per cent among its software engineers, and perhaps now an insurmountable problem with the FOS for AM-1.

Scientifically, the expected slip in the schedule will have little impact. Byron Tapley of the University of Texas, who will take over next week as chair of the science executive committee for the EOS Investigators Working Group, says there will be “no major Earth-shaking loss in science opportunity” if the delay lasts only a few months.

But the future of the EOSDIS may be on the line. Several outside advisory groups have recommended that NASA should switch to a distributed or “federated” system, whereby many different organizations would supply the research community with data from one or two EOS instruments.

In December the space agency picked two dozen Earth Science Information Partners, who will have three to five years to develop and distribute prototype data products for scientists and other users.

Meanwhile the seven large, centralized data archives organized under the current EOSDIS architecture are being reviewed by a committee of the National Academy of Sciences. The committee, which is chaired by Francis Bretherton of the University of Wisconsin, meets in Washington this week, and hopes to report by the end of the summer.

Tony Reichhardt

German sex killings prompt decision to create a DNA database

[MUNICH] Germany’s federal criminal office is to introduce a central DNA database for sex offenders, convicted murderers and others who commit serious crimes, including members of house-breaking rings. The minister of the interior, Manfred Kanther, approved the plan last week.

The move follows a series of largely unsolved sex killings of children in the past few months in Germany. Political pressure to introduce a DNA database grew particularly strong after the most recent case, the murder of a 13-year-old girl in Lower Saxony last month.

Rapid advances in DNA analysis and bioinformatics have made DNA databases invaluable to forensic scientists. Such databases are already used in the United States, Britain, the Netherlands and Austria, and pressure is growing for similar moves in France (see Nature 392, 430; 1998). But Germany has held back until now, mainly because of concern about privacy and data protection issues.

Police in Germany already use genetic fingerprinting based on samples of hair, tissue, saliva or sperm found on the bodies or clothes of victims. But they have not had the opportunity to compare the genetic profile of such samples with data held in a central DNA database.

In the case of the recent Lower Saxony murder, police had to request saliva samples from all the 18,000 men between the ages of 18 and 30 in the region in which they believe the murderer lives to allow a comparison with the murderer’s genetic fingerprint.

The samples are being analysed in police laboratories in Hanover. The procedure has been criticized for its high costs and relatively low likelihood of success, as donations are voluntary and the police are relying more on being able to rule out individuals than on identifying the murderer directly.

“Germany can no longer afford to do without an instrument that has proved an efficient criminalological tool,” says Detlef Dauke, a spokesman for the Ministry of the Interior.

The DNA database will be built up gradually. According to Dauke, the technical equipment is already available at the federal criminal office. Germany’s 16 Länder (states), which are responsible for policing, will start to transmit existing DNA data immediately.

It remains to be decided for which crimes compulsory production of a DNA sample will be required and for how long samples will be stored. And it is still unclear whether the operation of the database will need to be backed by new legislation, if its data are to be acceptable as legal evidence in a trial.

But there is a broad consensus that the database will help to speed the rate at which serious crimes are solved, and will help to lead to the immediate ruling out of innocent suspects.

Quirin Schiermeier
Earth Satellite Launch Put on Hold

In a blow to earth scientists, NASA's ambitious plan to launch a series of large environment-monitoring spacecraft beginning in June has hit a major snag. Software for data gathering has significant performance problems and must be reworked, agency officials said last week. That means the Earth Observing System (EOS)—the centerpiece of NASA's "mission to Planet Earth"—will be delayed by at least 6 months.

EOS AM-1, the first of the series, is designed to examine clouds, aerosols, the planet's carbon cycle, and the "radiation budget"—the balance between energy coming in from the sun and that being reflected from Earth. Four launches of major spacecraft are slated through 2002, plus a host of smaller missions.

Outside advisory panels and congressional lawmakers have long warned that the EOS information system poses huge technical challenges, given the vast amount of data it must process. NASA officials are now weighing whether to fix the Raytheon-built software or junk it and start over. John Dalton, NASA's deputy chief for the data system, says the earliest likely launch date is mid-December.

Science
17 Apr 1998 P367
The IRS’s doomed cure-all

FRANK HAYES

Can the IRS really fix its IT problems with one big $8 billion, 15-year project?

Nope. Not even with all the forms, schedules, attachments and additional instructions it can muster. Because even the IRS isn’t exempt from a fundamental IT reality: Big projects fail.

The IRS is in trouble. Leave aside the fact that the public hates it and it’s every politician’s favorite whipping boy.

The IRS’s systems and IS work are simply catastrophes. The agency failed its own audit in 1995. It misses up to $50 billion in revenue every year because of its antiquated systems. And it has blown $2.5 billion on failed IT modernization efforts since 1990.

The IRS — and taxpayers — can’t afford another failure.

Last month, new IRS Commissioner Charles Rossotti launched a complete overhaul of the agency’s systems. It can’t work. It’s doomed to failure.

Any 15-year IT project is doomed to failure. No matter how good the intentions, no matter how talented the people.

It’s not just that it’s too large to manage. It’s that reality won’t stand still.

Imagine it’s 1983, and you’re trying to map out the next 15 years of technology for your company. You don’t know that in 15 years PCs will be everywhere, in businesses and homes. You don’t know about the coming rise of LANs or Windows. You’ve got no clue about the tidal wave of the Internet.

What sort of 15-year plan could you come up with? Whatever it might be, that road map wouldn’t bear much resemblance to the IT reality of the past decade and a half.

Every four or five years, we’ve had to adjust to another technology shift — first PCs, then LANs, GUls and the Internet. Each shift has forced us to rethink our systems and direction.

What shifts will come next? We can’t know. But we know they’ll come every four years or so.

In that zigzagging IT reality, a successful five-year project is still possible. With luck, you’ll hit only one major shift during the course of it.

But a 15-year project? Forget it. It’s doomed to failure in a future that’s impossible to predict. It’s a Titanic with at least three colossal icebergs in its path.

So what is the IRS to do? Smash that 15-year project into a million pieces.

That means building a backbone to flesh out “core systems.” It means splitting processes into simple pieces instead of bundling them together into complex chunks. It means designing every part of the system so it can be replaced within six months.

Breaking the technology into little pieces makes it possible to break the project into manageable fragments, too. More important, it lets developers change direction when technology changes. Or business needs change. Or political mandates change.

And change they will. The week after the IRS launched the project, the Senate Finance Committee unanimously approved a slew of new requirements for the IRS. That’s bound to happen a lot over the next 15 years.

Rossotti used to run American Management Systems, the huge IT consultancy. He’s overseen lots of big jobs. But for the biggest project of his career, he’d better be thinking small, or he — and the rest of us — will be paying for it for a lot of April 15ths to come.

Hayes is Computerworld’s staff columnist. His Internet address is frank_hayes@cw.com.
NIH wasted millions on computers

Washington
In 1988, computer officers at the U.S. National Institutes of Health (NIH) contracted with IBM for a major computer system with a potential value over ten years of $806 million that was meant to meet all of the institutes' computing needs. Unfortunately, those responsible for deciding to go with an IBM mainframe system failed to ask NIH scientists what kind of computing systems they wanted. Had they done so, according to a report from the US General Accounting Office, they would have discovered that many of the scientists favored plain PCs and have no need for the "total system" for which NIH issued a contract.

The GAO report, which current NIH officials have not contradicted, records a priceless example of bureaucracy run amok. Although the NIH have various computer advisory committees, the bureaucrats who chose the IMB mainframe system failed to consult any of them. Nor, according to the GAO, did they interview scientists because "they did not believe it was worthwhile to spend time surveying scientists," in part apparently because of a survey 20 years previously that "produced unmanageable results".

The total system NIH now has not only has excess capacity, but also includes one full-sized computer dedicated to backup and related needs. However, GAO notes that NIH mainframes (leased in earlier years) are connected in such a manner that one backs up another during a system failure. "Consequently, NIH mainframes virtually never fail and have been so reliable that NIH no longer keeps mainframe failure data."

As to the scientists, who were heard from through an advisory body 4 months after the 1988 contract was signed, the availability of new software for personal computers rendered the need for mainframes for most scientific research outmoded. Besides, they said, the user charges for the multi-million dollar IBM system were too high.

So, while most researchers are happy with their PCs, NIH has wasted millions on a system is apparently does not need. GAO recommends that in the future NIH should solicit data on scientists' needs before buying them equipment they do not need and cannot afford. The current NIH leadership admits that is pretty good advice.

Barbara J. Culliton
U.S. agency puts new $71M system on ice

Data errors, slow performance main culprits

By Sharon Machlis

The U.S. agency for International Development (AID) last week confirmed that it suspended overseas use of a new computer system plagued by integration snafus, data transmission bottlenecks and response times so slow that critics say employee efficiency suffered.

For now, 39 field sites will go back to using the agency's old system for core accounting services and procurement contracts while problems with the Washington-based computers are ironed out. "We need to get the core functionality established," said Richard McCall, AID's chief of staff.

Slow worker

The New Management System (NMS), budgeted at $71 million, has been under fire since it was deployed last October. The AID inspector general's office criticized NMS for data errors and slow performance. In some cases, users had to spend days trying to process a single transaction, a March 31 report said.

AID developed the system because its old one couldn't properly track foreign-aid spending in various programs. But instead of improving accountability, NMS "increased the agency's vulnerability to fraud and abuse" because it went live before it was ready, according to the inspector general's office.

Agency Administrator J. Brian Atwood defended the decision to deploy the system all at once. He said a phased-in approach would take years while more data "of questionable accuracy" was generated on the old system.

"In the long run, it will save us time and tax dollars," Atwood said at a congressional hearing in March. "I understand the risks, and I believe that our approach will pay off."

The new system can't handle the large amount of data that passes among AID offices, McCall said. The agency must decide whether to boost expensive satellite bandwidth to handle real-time transactions or move to some batch processing.

"I don't think people understood the amount of data that would be transmitted over the system," he said.

Designers also initially failed to grasp the difficulty of integrating legacy accounting systems, he said.

"We thought we had three primary accounting systems," McCall said. But numerous in-field alterations to basic systems over the years meant the agency had closer to 80 different accounting systems. Some of the resulting data didn't import correctly into the new system.

In addition, McCall said, system designers should have stayed focused on core requirements instead of trying to immediately add features that users requested after early tests. For example, some overseas employees wanted to be able to call up data from any foreign site. Although that is an attractive feature, he said, "that taxes the system. You don't really need that now."
Feds log some IS successes amid more-public failures

CONTINUED FROM PAGE 47

from a supply of 380 days to 10 days and reduced order and shipping time from 20 days to one day.

A client/server system at the Food and Drug Administration is saving U.S. businesses $1.2 billion over seven years by streamlining import processing.

An intranet-based federal property management system will return its initial investment in 23 months while reducing information access time from days to minutes.

The Environmental Protection Agency won a best practices award for its Envirofacts Data Warehouse. It knits together and offers to the public 80G bytes of environmental data — information previously available piece-meal and only to EPA specialists.

The system — whose development was outsourced — uses the Web and commercial client/server, database and geographic information system (GIS) products.

“Technology became our friend rather than our fear,” said Envirofacts director Pat Garvey. The Web site got 800,000 visits last month, he said.

The GSA’s Public Building Service site offers a central point for information about real estate and services for government agencies.

“It’s responsible management to report back to your owners — taxpayers and the Congress — what they are getting for the $40 billion to $50 billion the government invests each year in IT,” said Alan Balutis, deputy CIO at the Commerce Department and chairman of the committee that found the best practices. “There really are a lot of things that demonstrate a solid return on investment, and people should see that the landscape isn’t totally bleak and dark.”

The projects range widely in application, size and technology, but certain elements recur: use of commercial, off-the-shelf products; outsourcing; use of the Internet and World Wide Web; rigorous focus on performance metrics; and intimate involvement of end users.

Other factors include a growing tendency among government agencies to focus on their core missions and outsource IS projects, according to government IS consultant Warren H. Suss, president of Warren H. Suss Associates in Jenkintown, Pa. Agencies are also increasingly turning to commercial applica-

AGENCYWIDE EXPERTS

The project was a success in part because the project team, “instead of being IT techies,” was made up of environmental experts from across the agency, Garvey said. He said he didn’t go to the CIO for funds for a big, agencywide project — a strategy that wouldn’t have worked given budget constraints. “We’ve been very creative; we’ve gone to individual offices that are trying to solve public access problems or data integration problems or GIS problems or data standardization problems and said, ‘We’ll take the money you have in your budget for that problem, and we’ll solve it for you.’ ”

Nine of the 20 projects used Web technology: “Making customer service and data sharing Internet-oriented is just taking all kinds of risks and complexities out of development projects,” said Philip Kiviat, the Industry Advisory Council’s liaison to the CIO Council.
Trouble with Computer Systems

A book from England
*(Crash: Ten Easy Ways to Avoid a Computer Disaster, by Tony Collins)*

Two reviews of the book are on the following pages.
- One is from the New Scientist (12 July 1997)
- The other from the Daily Telegraph (London), July 15, 1997. The first part of this review is lost--doesn't matter.

All systems not go

Crash by Tony Collins with David Bicknell, Simon & Schuster, £20, ISBN 0684816881

The road to large-scale computerisation is strewn with banana skins. According to Tony Collins, 60 per cent of projects fail. He analyses the reasons, drawing on fascinating case histories.

For the commissioning organisation's ambition to have the all-singing, all-dancing system with which to impress the public and steal a march on rivals can prove disastrous. It was partly for this reason that the Wessex Health Authority spent about £50 million on a system, only a tiny part of which was ever used. The project was promoted by the then Minister of Health and by the health authority managers, all of whom wanted a share of the glory. It became unstoppable, since nobody would report bad news for fear of losing their jobs. The whole project ran hopelessly out of control until a new information systems director took charge. She promptly accused some sup-

It is not just UK organisations that are accident-prone. In America $81 billion was lost in 1993 alone on failed computer schemes, according to market researcher the Standish Group.

The picture Collins paints of British managers is appalling: for the most part they appear to be lazy, ignorant, gullible and self-seeking. *Crash* is essential reading for any organisation thinking of investing in a computer system. It should also appeal to anyone who enjoys the spectacle of the great and the good coming to grief.

It is little different in the private sector. In 1993 the Stock Exchange abandoned Taurus, its proposed paperless settlement system, after spending £75 million on development. The wider cost to the City may have been as much as £400 million.

Book Distribution specialist Tiptree lost its position as the British Book Awards Distributor of the Year in 1992 after installing a new warehousing system that was supposed to improve service.
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Collins, a quietly sarcastic man, writes: "His hard line against suppliers so impressed Wessex that it did what governmental bodies tend to do when confronted with a conscientious, public spirited, apolitical, dynamic troubleshooter. It made her redundant." Two senior managers involved in the project were criticised by the district auditor and subsequently received their just rewards. They were knighted.

Why has £300 billion been spent worldwide on failure? Collins suggests that much of the blame should rest with the customers, whose requirements may be too vague—or change during the project, or whose schemes may be just too complex for the end-user (and for the programmers). He advocates three ways of dealing with these problems. Before the project design begins, the staff who will use the terminals must be consulted and persuaded to back the system, otherwise they may be unable to use it and may end up sabotaging it. Secondly, staff from the supplier of the computer system should work in the firm so they can build a realistic picture of what goes on. Finally, the procedures in use by the organisation should be simplified as much as possible. A sloppy or complex system can be managed by people but not by computer: a program cannot cope with mistakes.

Among Collins's other recommendations are: don't use a recondite computer language or you may be dependent on a single firm for maintenance. Instead, go for off-the-peg systems wherever possible—they will be well tried. And never fall for the sunk-costs error—ploughing more money into a project just because a large sum has already been invested.

The picture Collins paints of British managers is appalling: for the most part they appear to be lazy, ignorant, gullible and self-seeking. Crash is essential reading for any organisation thinking of investing in a computer system. It should also appeal to anyone who enjoys the spectacle of the great and the good coming to grief.

A physicist by mistake
◆ Nigel Calder on Andrew Brown
◆ Peter Hammond on insect identification
◆ Stuart Sutherland on Tony Collins

'A sloppy or complex system can be managed by people but not by computer: a program cannot cope with mistakes'

12 July 1997

New Scientist
problems with computer systems

- A second review of the book called "Crash"

The mistakes of computer system problems

Health Service Executive had allowed pilot projects costing about £40m to continue even though the Executive had concluded that these schemes were unlikely to be copied by other hospitals. More seriously, the draft report implied that the Health Service Executive had learnt from the earlier collapse of projects at the Wessex Regional Health Authority, which lost up to £65m. Both of these comments were excised from the published report.

It is little different in the private sector. In 1993 the Stock Exchange abandoned Taurus, its proposed paperless settlement system, after spending £75 million on development. The wider cost to the City may have been as much as £400 million.

What do the NHS, British Gas and the Performing Right Society (symbolically represented here by Dire Straits) have in common? They've all been seriously embarrassed by IT failures.

Marching toward oblivion: the 10 steps of impending doom

In virtually all the disasters, the same 10 themes recur:

1. A tendency to be over-ambitious.
2. A feeling among computer managers that they should know it all, and cannot admit it when they don't.
3. A belief among the entire project team that computerisation must be a good thing, and to suspect otherwise is an Orwellian thought-crime.
4. A chief executive who is in the best position to judge a computer project because he knows nothing about computers, but fails to intervene — because he knows nothing about computers.
5. Readiness to accept "It'll be all right on the night!" assurances from suppliers; assurances that suppliers studiously avoid writing down.
6. Over-reliance on consultants who may have a financial interest in prolonging ill.
7. Avoidance of cheap, proved, off-the-shelf packages in favour of costly, unproved, custom-built software; or, worse, the tailoring of a standard package.
8. Unwillingness by middle and senior management to impart bad news to the board — mainly because the board will make known its resentment of anyone who tries.
9. A mistaken belief that the contract makes it easy to sue the supplier if all goes wrong.
10. The buck stops nowhere.

Daily Telegraph, London

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Daily Telegraph, London

Daily Telegraph, London

Daily Telegraph, London

Daily Telegraph, London
LAST YEAR, AMERICAN COMPANIES SPENT $320 BILLION ON INFORMATION TECHNOLOGY AND INCREASED PRODUCTIVITY BY 1.4%.

SOMEHOW, WE DON'T THINK THIS IS THE RETURN ON INVESTMENT YOUR CEO HAD IN MIND.

According to a Gartner Group study, one reason IT expectations rarely match projections is that untrained people use less than 25% of their applications. Which is why guaranteed training should be a critical part of any IT budget.

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This is an interesting ad, but----
If people spend too much time learning software, the productivity will get worse. – R. Fanne
A Letter about Databases — Object Programs

Disoriented

Sir—You imply that object-oriented programming ("Oops", February 28th) solves the problem of labyrinthine software programs. If only it did. Object-oriented applications suffer from a different set of problems. The biggest problem in information technology is managing complexity (something humans are not good at), and object-oriented programming requires more skill at this, not less.

The 50% of programming you describe as object-oriented is actually component-based. Components look a little like objects, but do not provide "inheritance", polymorphism or the other main aspects of object-orientation. All they do is package an object and its functions in a tidy black box.

Whatever you may read in the brochures, an object-oriented database cannot resolve the kinds of problems raised by trying to store images, sounds and movies in a database. The issue is: can you search on it? If not, there is no reason to store it in a database. It is far more efficient to store an image in a flat file, and store the name of that file in the database, than it is to try to shoe-horn the image into the database.

An object-oriented approach does not change this basic economic principle.

By concluding that object-oriented programming languages are a fix for the ills of the software industry, you imply that the same approach can be used in databases. If there is one lesson we have learnt in this business over the past 30 years, it is that you can make things work only by simplifying them. Combining data and code in one huge database is a terrible solution.

Antwerp Pieter Hintjens

The Economist
March 21, 1998

Some Points in the Letter Above:

• Does object-oriented programming solve the problem of huge software problems? NO.

• It is more efficient to store an image in a flat-file.

• We learned one lesson in the past 30-years; you can make things work only by simplifying them.

• Combining data and code in one huge database is a terrible solution. (True, but I’m not sure how many people might try to do this—Roy Jenne)

—Roy Jenne
IT'S LATE, COSTLY, INCOMPETENT
—BUT TRY FIRING A COMPUTER SYSTEM

Companies get stuck with 'runaways' that trample all over their budgets and reputations

It's a project that, for Allstate Insurance Co., has redefined the concept of sparing no expense. The Sears, Roebuck & Co. subsidiary set out in 1982 to build the insurance industry's most sophisticated computer system, one that would make its competitors quake. The system was supposed to automate Allstate's office operations and shorten the normal three-year period needed to introduce new types of policies to one month. Allstate hired Electronic Data Systems Corp., the systems-integration company, to develop the software and help install it on the firm's hardware. The target date for completion was December, 1987; the target cost was $8 million. Some $15 million later, Allstate has a new project consultant, a new deadline, and a new cost estimate: $100 million.

The Allstate case is a classic example of a computer runaway, a system that's millions over budget, years behind schedule, and—if ever completed—less effective than promised. A recent Peat Marwick Mitchell & Co. survey of 600 of the accounting firm's largest clients highlighted the problem: Some 85% currently have major runaways. Indeed, experts say, such diverse systems integrators as the Big Eight accounting firms, computer suppliers, and even in-house data processing staffs are fast building a record of mediocrity. Says James A. Willbern, a management consultant at Peat Marwick: The industry's "ability to install systems is pretty crummy."

The problem is so acute that it has created a lucrative industry of its own. In 1986, Willbern set up a group at Peat Marwick to rein in runaways. Since then, he has had $30 million in revenues from nearly 20 clients, including Allstate.

BLOWN DEADLINES. Allstate's project ran on track for about a year before it went awry. First, deadlines for programming and for testing hardware started slipping by. Then Allstate technical staffers quarreled over the dimensions of the project and each other's roles. By 1987, the huge project had changed from savior to albatross, and Allstate had had enough. It started over with Peat Marwick, which helped revamp and train the in-house staff working on the system, now targeted for completion in 1993.

Although there are many explanations for the epidemic of runaways, there seems to be a common thread: Neither buyers nor builders of computer systems have adjusted their deadlines to reflect the increased complexity of computer projects. A decade ago, a $2 million computer system that took longer than a year to build was a rarity. Such systems were self-contained units with no interweaving of technologies and data bases. Connectivity was a foreign word. Today, although companies are developing systems of such magnitude that entire businesses are sculpted around them, many designers still use the old approach. For better, consultants say, is to divide major projects into modules that can be finished one at a time.

"It's the difference between counting the number of people in a small room and doing a U.S. census," says Wayne Stevens, a leading systems-design theorist. "It takes two different skills, and when you go from the simpler to the more complex project, you'd better do things differently."

Tom Heffy learned this the hard way when a runaway carried Blue Cross & Blue Shield United of Wisconsin to the brink of disaster. In 1983, three years before Heffy became chief executive of the Milwaukee-based insurer, it hired EDS to build a $200 million system to coordinate all the services then being handled by five computers. The system was completed on time—in just 18 months. But it didn't work. One example: Because of an entry error, the computer sent out hundreds of checks to the...
fictitious hamlet of None, Wis. A month later the checks arrived back at Blue Cross for redressing. During its first year, the system disbursed $60 million in overpayments or duplicate checks.

Before the runaway was stopped, Blue Cross lost 35,000 members—a setback it attributes to the computer problem. EDS contends foul-ups were inevitable because of the multitude of data to be converted from the old system to the new. But Blue Cross wants EDS to reimburse it for some of the lost revenues. The dispute is now in arbitration.

Inheriting this mess in 1986, Hefty immediately instituted tough quality-control measures. He found that the system’s developers never adequately used checkpoints during the project to evaluate whether the system was on track. Only that, he says, would have ensured a more successful outcome. Others concur. “In larger projects, you should have a detailed review every 12 months,” says Jack Epstein, a vice-president at the research firm International Data Corp. “In shorter-term projects, you could meet every six months. These meetings, Hefty adds, should include senior management. Most nontechnical executives are unwilling to take an active role in developing a computer system—until costs spiral out of control. “I let it slip, that’s the problem,” says the president of a medical diagnostic firm. “I kept hands off, and it hurt me in the end.”

‘PROMISING EVERYTHING’ This company experienced a nightmare last year when its new computer system, during its first day in operation, lost information pertaining to thousands of crucial medical tests. The software couldn’t handle the volumes of data it had to deal with. Luckily, the loss was not permanent—but it took 30 days to reconstruct the records. At that point, the company's president decided to “take a clean look at this thing.” He fired the data processing chief, hired a new technical staff, and announced that he would be closely involved with all future systems development. A new system is expected to be completed by the end of this year.

One problem with giving data processing professionals and outside suppliers free rein over a new computer system is that they tend to be overly optimistic: “They sell expectation, not reality,” says Dave Elenburg, who last year led a group that cleaned up a multimillion-dollar runaway in the workers’ compensation system in Oklahoma. “They feel they have to keep the executives happy by promising even what they can’t deliver. And suppliers are out for sales.”

One common gripe among customers is that after they hire a supplier to direct the development of a system, the work is frequently assigned to “students straight out of tech school,” as Elenburg puts it. The more talented professionals who represented the supplier in the initial meetings are busy trying to bring in new business. Robert C. Bobb, city manager of Richmond, Va., was so incensed two years ago when Arthur Young sent inexperienced technicians to develop the management system for the city’s utilities that he now writes into all consulting contracts the names of the people who must work on the project. Arthur Young says that its senior consultants were “heavily involved” in the Richmond project. But Bobb says that’s not enough: “The partners have to begin to do the grunt work.”

DISMAL PICTURE. So do the people who ultimately will use the system. Too often, a runaway occurs because during the planning stages the staffers who eventually will be operating the computer are not consulted for ideas about how the system should work. “User involvement cannot be casual,” says George Hathaway, a runaway-buster at the Index Group, a Cambridge (Mass.) consultancy. “The mind-set has to be emphasized more to users that the computer works for you; you don’t work for it.”

As dismal as the picture is, there are glimmers of light. Many runaway consultants feel that the recent round of failures has taught buyers caution: “Corporate executives are becoming very wary about dropping millions of dollars into a bottomless bucket,” says Phil Dressler, a Dallas-based runaway salvager. Moreover, Dressler adds, as such executives become more computer-literate over the next few years, they will be less afraid to take charge of technical projects. And data processing professionals are becoming better managers, increasingly using the modular approach to building systems. What’s more, unyielding competition in the $5 billon-a-year systems-integration field will sooner or later force the companies in it to be more attentive to customers’ needs or be losers in a booming market.

These trends are cause for hope. But until they spread, it seems inevitable that millions more will be squandered on computer systems that fail to work or even to see the light of day.

By Jeffrey Rothfeder in New York