New Technologies, Old Problems

Historical Amnesia and Enterprise Computing
Structure of the Talk

- General Introduction
  - My Research
  - Information Systems in the 1990s

1: Business Process Reengineering

2: Enterprise Resources Planning

3: The Data Warehouse

Conclusions
Broader Research

- Multiple publications, presentations
- First presentation of final chapter
  - Major trends in 1990s
  - Stresses continuity
Managerial Technicians

Claim technical authority over some managerial activities.

- Construction of new kinds of expertise
- Seek group mobility
- Identities tied to construction, elevation of corporate departments
- Conflation of managerial and professional ambitions
“Just a Second! There!—there are the facts. Now you can decide.”

—all the facts concisely in the least possible time; glance down the panel holding RAND cards till you reach the name you want, swing up the card just ahead—and there are all the recorded facts. With RAND Visible-Card Systems one clerk does the work of four.
Big Project

- First full-length, professional history of corporate IT usage

- Three Strands
  - Organizational & Institutional
  - Identity & Professionalism
  - Technology & Practice

- Goes back before the computer
  - “Systems” work
  - Office management
  - Punched card machines
Methodology

**Narrative**
- Charts, tables, figures for support

**Mixture of sources**
- Journals, magazines, conference proceedings
- Archival holdings (producers, users, associations)
- Contemporary surveys
- Memoirs, Interviews
Enterprise Computing in the 1990s
Enterprise Computing

- Large scale, corporate systems. Mainframes plus
  - Network backbones
  - Inter-departmental applications
  - Technical standards
  - Centralized databases
  - Intranet
- Used to be the only kind (almost)
- Striking continuity over decades in issues
  - Practical
  - Technological
  - Professional
The 1990s – New Technology

- Large-scale relational databases
- Incorporation of PC into enterprise systems
  - Graphical User Interface
  - Client-server technologies
  - RAD (Rapid Application Development)
- N-Tier model
  - Object Orientation (C++, Java)
  - Distributed Objects, Brokers
- The Internet, “e-business”
The Productivity Paradox

“You see the computer everywhere but in the productivity figures”
- Robert Solow – MIT Economist

By mid-1990s business spends on computers
- 3% of GNP
- 50%+ of capital investment
## Rise in GNP Does Not Correlate

<table>
<thead>
<tr>
<th>Period</th>
<th>Computer Spending (% of GNP)</th>
<th>GNP Growth (annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s</td>
<td>0.003</td>
<td>4.5%</td>
</tr>
<tr>
<td>1970s</td>
<td>0.05</td>
<td>2.95%</td>
</tr>
<tr>
<td>1980s</td>
<td>0.3</td>
<td>2.75%</td>
</tr>
<tr>
<td>1990s</td>
<td>3.1</td>
<td>2.2%</td>
</tr>
</tbody>
</table>
White Collar Productivity

- How much economic output you get per unit of input
  - Gives sustainable, non-inflationary growth
- Computer is supposed to make clerical and processional workers more efficient
- Overall labor productivity grew 1.1% p/a 1973 to 1997
  - Most of GNP rise is from working harder
  - Real median wages fell from mid-70s to mid-90s
At The Firm Level

Figure 8  No correlation in spending on computers and profitability
New Approach 1: Business Process Reengineering
A Business Revolution

Former CS professor
Rhetoric of revolution
“Take a machine gun and an axe to the organization chart”
“Shoot the dissenters”
Insists new idea
- Old ways were good before
- New technology means new approach
BPR – Fate

- Ushers in great consulting boom
  - Also attractive to internal IT leaders
- Term applied quite indiscriminately
  - Often used to justify any layoffs
  - “Chainsaw” Al Dunlap, etc.
- Backlash grows from mid-1990s
How New Was It?

Some obvious antecedents
- Industrial Engineering (Davenport)
- Taylorism/Scientific Management

Closest antecedents
- Systems and Procedures Movement
The “Systems Men”

- Systems and Procedures Association
  - Chartered 1947 (informally 1944)
  - Spread very rapidly in early 1950s

- Managerial Technicians
  - Corporate
  - Staff role – advisory, not supervisory
  - Aspire to true managerial power
Who Were The Systems Men?

- World War II was genesis of movement
  - Administrative innovation for wartime production
  - Seek to apply rational, scientific, systems approach
- Thrive with shift to multidivisional organization
- Self-consciously modern group
  - Mostly originating in accounting departments
  - Parallel with, but separate from, industrial engineering
  - Even lay claim to being “information engineers”
Great dreams...

Management Generalist

- Technocratic mandate from top executive
- Audit departmental effectiveness
- Reorganize departmental structure to unlock efficiency, “re-engineering and replanning the entire system”

(1958 presidential address)
... but limited respect

- Write manuals
- Improve clerical procedures
- Design forms
“Generalist” Experts

- Try to build a profession around toolkit
  - Form Design; Report Design
  - Procedures Manual; Workflow study
  - Punched card methods, etc.

- Generalist case hard to make
  - Claim management methods as technical expertise
  - Executives respect technologies, specialists more than managerial generalists

- Increasingly tied to computer
Systems vs. BRP

- Technocratic Mandate
  - Who is the “engineer”
  - What are they an expert in?

- Role of Consulting Firms
  - How to square with authority of managers?

- Appeal to Computing Departments
New Approach II: Enterprise Resources Planning
ERP

- Enterprise Resources Planning
  - Not very meaningful term
- Packaged enterprise suite
  - SAP/R3 is best known
- Modules for different functions
  - Finance
  - Logistics
  - Personnel
  - Order processing
ERP – Benefits

- Operational efficiencies
  - Software is pre-integrated
- Less work on ad-hoc fixes
- Better information flow
- Improved managerial control
- Reduced support burden
  - Spread maintenance costs
  - Skills more available
- Proven methodologies, technologies
ERP in Practice

- Forces difficult standardization
  - Between divisions
  - To fit constraints of package

- Slow, expensive process
  - Average of two years
  - Cira $50,000 per seat!
  - Huge boom for consultants
How New is ERP?

Main ideas:

- Total integration of administrative processes is possible on operational basis
- Packaged software is the best basis for this system
- Business processes, jobs, must be altered to exploit technology
The Computer Enters Business

Remington Rand presents

The Electronic Era for Business with UNIVAC*

...the first universal electronic system designed for both management and science

* A development of the Remington Rand Company
Claims for Computer, 1953

“We can set our course towards push-button administration, and God willing we can get there... The ominous rumble you sense is the future coming at us. 

...the potential effect of electronics is of the order of that wrought by moveable type. The changes ahead appear to be similar in character but far beyond those effected by printing.”

Information Technology

  - First use of phrase “Information Technology” for computers.
  - Extremely influential

Business school professors and computers as new managerial elite

Harvard Business Review
November-December 1958

MANAGEMENT in the 1980’s

By Harald J. Linstedt and Thomas L. Whisler

Over the last decade a new technology has begun to take hold in American business, one so new that its significance is still difficult to evaluate. While many aspects of this technology are uncertain, it seems clear that it will move into the managerial scene rapidly, with definite and far-reaching impact on managerial organization. In this article we would like to speculate about these effects, especially as they apply to medium-size and large business firms of the future.

The new technology does not yet have a single established name. We shall call it information technology. It is composed of several related parts. One includes techniques for processing large amounts of information rapidly, and it is represented by the high-speed computer. A second part centers around the application of statistical and mathematical methods to decision-making problems; it is represented by techniques like mathematical programming, and by methodologies like operations research. A third part is

First use of phrase “Information Technology” for computers.
Extremely influential Business school professors and computers as new managerial elite
Total Systems

“Totally Integrated Management Information System”

From 1962 to 1970 – dominant idea for correct role of the computer in management

- All information, instantly, all managers, whole firm
- System include models, forecasts, projections
- Used directly by top executives
- Real-Time, On-Line
This Will Realize Potential of computer...

ADP – THE STILL-SLEEPING GIANT

By John Lederer

Automatic data processing (ADP) has certainly arrived. But somehow it has not produced changes of the order of magnitude that we who have pioneered in the field expected. Why is this? And what major changes in management still lie ahead as the revolution in information technology gathers momentum?

Speedy and Spotty

Let's take a quick look at the record since ENIAC and Mark I made their appearance 18 years ago. In that brief period five distinct phases may be discerned:

1. First, there was the cold rush of potential users in the early 1950's. Typical of this period is the memorandum the French scientist Robert Goddard sent to Harvard's John Brinton Myres in 1941:

   "I wonder if you have any use for data processing?"

   "Yes, I have. We have a data processing department.

   "Yes, that's what I mean."

2. Next came the status "kick" of 1956-1957 when corporate presidents decided they had to keep up with the Joneses. Four-color photos of walnut-paneled, deep-carpeted, "showcase" installations graced corporate annual reports, and executives were pleased to see computerized accounting systems that were running right on schedule to wrest another out of the golf course.

3. Then, with the onset of the 1957 recession, came disillusion as the initial installations failed to live up to expectations. Nowhere was this more evident than in the new corporate data-processing departments where the same personnel were busy building the "computer of tomorrow".

4. The fourth era was ushered in during the early 1960's. It was characterized by a growing sophistication on the part of business managers regarding at least the obvious data-processing applications. In addition, a number of new vendors entered the market. If anything, these developments were more than offset by the problems of computer design.

In short, data processing has been slow to mature. As one consultant has observed: "Unrealized Potential"

Of course, the many, many ADP systems in use are more than paying their way, and some are performing tasks that were not possible before. But even in the best applications we have not come close to realizing the computer's true potential. Let me hazard some reasons why.

Deteriorating factors differ from installation to installation. Sometimes... but not always... the equipment is at fault. In most cases the problem can be traced to management's door:

- Inadequate planning, mostly panache rather than corporate-wide in scope.
- Not enough fresh thinking, and too much reliance on canned approaches.
- Selection of the wrong people to plan the installation – e.g., technical specialists who fail to acknowledge or even appreciate their limited understanding of business practices.
- Overemphasis on hardware and underemphasis on the design of comprehensive systems.

These are serious faults. But the basic problem lies deeper. It is far more subtle, yet in a
Your business.

Your business with a Univac Total Management Information System.

Management is no longer the remote apex of a pyramid but the hub of a wheel. Lines of communication are direct. Every area of activity is monitored on an absolutely current basis. And centralized control of decentralized operations becomes a reality. Painlessly.

There are three distinct Total Management Information Systems graded for businesses of varying size and complexity and known collectively as The Univac Modular 490 Real-Time Systems.

For information about them, get in touch with the Univac Division of Sperry Rand Corporation.
a more relaxed, leisurely management environment. The uneasiness will be replaced by a feeling of confidence in the completeness and timeliness of information and in the decisions based on that information....
Problems of Total Systems

- Impossible to build at the time
- Rigidity imposed by computerized system
- Managers can’t define “information needs”
  - Most executive information is not a by-product of routine transactions
- Expense of real-time operation hard to justify
- No rush to reorganize corporation
  - If responsibilities remain within functional bounds, so can information
The Fate of MIS/Total Systems

- MIS redefined by 1970s
  - “total” part downplayed
- Backlash grows in elite management press
  - MIS remains term for computer study in business schools
  - New name for computer department

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Parallels with ERP

**Alike**
- Integration of operational, administrative systems
- Vendors, consultants sell to top management
- Firms rush into whether need or not
- Expected benefits hard to realize

**Different**
- ERP is technologically possible
- ERP relies on packaged software
New Idea 3: The Data Warehouse
“Information” ties together all levels of management & operations.

Bottom level of the pyramid is the “data base”
Hopes for MIS reborn with DB

“Writings on MIS have waned recently and have largely been replaced by writings on the Data Base” (1973)

The “Data Base Administrator”
- Originally expected to take responsibility for “data as a resource… much broader than machine readable data” (1974)
- “something of a superstar” (1975)

DBMS technology expected to build integrated, company wide DB
Data Base Management System

- New concept in early 1970s
- DBMS as software layer between data, users
  - Different interfaces, languages for
    - Programs & programmers
    - Ad-hoc managerial reporting
    - Data definition
    - Maintenance and administration
- Hopes for managerial use
  - Respond instantly to arbitrary query
DBMS usages in the 1970s

Advantages mostly for programmers
- easier reporting,
- Program/data independence
- faster application development,
- easier maintenance
- better integration of different applications

Integration proves harder than expected
Help with conversion to disk and multitasking operating system
Not One Big Database

- Big central database doesn’t work
- Finish up with dozens/hundreds of little data
databases
  - Physically separate
  - All incomplete
  - Different data formats
  - Different concepts of data
- Dominant model is “relational” (eg Oracle)
  - Good for updating
  - Flexible
  - Can be slow & complex to extract data for reports
Data Warehouse Concept

- Emerges early 1990s
- One big DB for everything has failed, so
  - Leave “transactional” systems spread out (physically, organizationally), BUT
  - Make a second, read-only copy of everything in a centralized “data warehouse”. Update regularly.
- Lots of work for consultants
  - Copying, “cleaning”, reformatting data
  - Restructuring data around business areas and for easy querying
  - Providing query tools for managerial users
From Recent DB Textbook

Management Hierarchy

Top (strategic)

Middle (tactical)

Lower (operational)

External data sources and summarized, tactical databases

Summarized, integrated operational databases

Individual operational databases

Operational databases
Data Warehouse -- Practice

- Many systems limited in scope
- Enormous on-going costs
  - Import routines must be maintained
- Managers often fail to use
4: Other New Ideas
CRM

Customer Relationship Management

- Aim: “help companies keep track of their customers and boost revenues by increasing customer loyalty”
- Customer database integration
- Sales/service force automation
- Data mining tools

Vendors promote packaged systems
- Siebel Systems pioneered
Backlash Came Quickly

“most Fortune 500 companies are involved in some sort of CRM project, experts say, and many multimillion dollar initiatives have quietly stalled or failed as executives search for business benefits and salespeople shy away from technology they say won't help them.”

Knowledge Management

Movement launched in mid-1990s

- “Knowledge” as more general, free-form than “information”
- Shift focus from technology to people
- Ties to information science

Term gets applied to a lot of software

- Early attempts center on “knowledge repository”
“KM has fallen victim to a mixture of bad implementation practices and software vendors eager to turn a complex process into a pure technology play. The result: Like many a business concept, KM has evolved from a hot buzzword to a phrase that now evokes more skepticism than enthusiasm.”

Real Time Enterprise

“In the real time corporation... information becomes more current... because you are eliminating steps of inefficiency. Because information comes in real time, senior people get to make more decisions.”

Vinod Kholsa, venture capitalist and Sun Microsystems co-founder, 2002.
Conclusions
Lessons

- Role of fads cannot be ignored
  - Premium on apparent novelty
  - Disillusion with one idea lays ground of next

- History matters

- Technology cannot solve organizational problems
  - Yet technology is so much easier to sell
  - Technical expertise so much easier to define
  - Standard solution may not be good fit
Difficulty in Combining Technical and Managerial Expertise

Rapid pace of technological change
- Always expected to slow down.
- Can’t wait for it to go away.
- Can’t “educate” managers

“Alignment” is much harder said than done

How to manage technology without understanding it?
Integration – An End in Itself?

2001 survey (Cutter Consortium)

- Integration of legacy systems & e-business as #1 issue
- “much of our industry suffers from the delusion that total integration is achievable.”
- “the vision is a chimera, a false goal that encourages, at best, frustration over dashed hopes and, at worst, misallocation of IT resources.”

Visit My Website

www.tomandmaria.com/tom

Papers (4 published, one forthcoming, one draft), including “Inventing Information Systems”

Information on research project

Syllabi & resources from 4 distinct courses

Computer history resource guide