INDIVIDUAL, ORGANIZATIONAL, AND SOCIETAL IMPLICATIONS
OF END-USER COMPUTING

Jon A. Turner

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Center for Research on Information Systems
Computer Applications and Information Systems Area
Graduate School of Business Administration
New York University

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ABSTRACT

This paper considers four aspects of end user computing: false stereotypes, information tasks supported, inconsistency between flexibility and formal systems, and contributions made by information technology.

Individual, Organizational, and Societal Implications
of End-User Computing

The task given to this panel was the identification and
expansion of the major themes of the conference: What was said
and what was omitted; what issues are fundamental and how they
need to be pursued. The panel consisted of Dr. Tora K. Bikson,
Senior Scientist at the Rand Corporation; John Gosden, Vice
President of Information Technology at The Equitable Life
Assurance Society of the United States; and Philip C. Semprevivo,
Principal, Deloitte, Haskins and Sells. It was led by Professor
Jon Turner of NYU.

Recently, Tora Bikson has been studying technological
innovation in organizations and, for the last several years,
under grants from the National Science Foundation, she directed
social aspects of a pilot project to implement electronic mail
with Rand Corporation's executive management and has investigated
the use of information technology in a diverse sample of other
corporations. One of the strengths of her work is that it is

both conceptual and empirical.

John Gosden has been involved with computing since the early
1950s, first at LEO Computers in England, after taking his degree
in mathematics at Cambridge, and then with MITRE Corporation in
the US. He has been active in our principal technical society,
the Association for Computing Machinery (ACM), and he recently
chaired its national publications committee. In his position as
chief technology officer for Equitable Life, Gosden is
responsible for identifying emerging technologies, and
encouraging and nurturing their use within the company.

Phil Semprevivo consults widely in the Information Services
and Organization Development area. He has written several well
known textbooks: *Teams in Information Systems* (Yourdon Press,
1982) and *Systems Analysis* (SRA, 1983), both used extensively in
the classroom and by practitioner. Prior to joining Haskins
Sells, he taught at the State University in Binghamton, NY.

The panel concluded that four themes emerged from the
conference:

1. End User Computing (EUC) as characterized is full of
   many false stereotypes.

2. EUC as described supports mainly structured tasks in
   conventional ways. Yet, the real gains appear to be in
   role enhancement and process innovation.

3. There seems to be an inconsistency between the flexible tools suggested by EUC and the rigid, formal systems we are developing in our computer applications and distributed data bases.

4. Strategic decision making doesn't recognize what and how information technology can contribute.

False Stereotypes in EUC

As currently portrayed, EUC refers mainly to the use of a personal computer (pc). This view neglects the historical evolution of EUC, which, starting first with time sharing in the 1960s and continuing through Information Centers in the 1980s, has attempted to provide computer users with facilities more directly under their control. Interactive languages, time-shared operating systems, interpreters, virtual memory and other innovations are all part of this heritage. Equating EUC to pc(s) only constrains greatly its meaning and scope. It suggests, moreover, that EUC is a recent development. There is a great deal of computing in organizations, that, while not pc based, still would be considered computing by end users. Professionals have been engaged in such activities for many years.

Another biased picture is that of the manager pouring over his or her pc doing reams of analytic work. The suggestion is that managers are just waiting to embrace a pc in the pursuit of constructive activities. However, Mintzberg [Mintzberg 73] and

other observers of executive work have noted that managers spend most of their time communicating with peers, subordinates, superiors, or members of their various networks. They show little inclination for written tasks, desk work or detailed analysis. Rather than initiating activities, they are response driven. Consequently, much remains to be done before the pc, or EUC for that matter, will be accepted and used constructively by most executives (with the exception of internal and external electronic mail).

A third erroneous view is that end users will not require training - or, alternatively, that pc users need the same training as users receive for large systems. The original concept for the Information Center [Hammond 82] was quite clear about the needs and processes of user training. It was to be performed by the IC staff and it was to be on fourth generation languages, data dictionaries, and other tools supported by the IC. Pc users will obviously need training of some fashion, but it will be different than that provided to users of large systems. Identifying the goals of this training and what it consists of is a major open issue. By not being explicit about the need for learning support on pc(s), we are misleading management and practitioners.

Another misconception is that the micro-to-mainframe link

connection has been resolved. Using the current communications software still requires considerable knowledge of the host system. In general, one must enter the application on the main frame, issue the proper command sequences to (say) extract data from a file, create an new file, name it, and save it. Then one exits from the mainframe, turns the micro on, enters the communications software, connects to the main frame, starts the communications software on the mainframe, initializes the transfer of the new file, and switches to the micro to observe the results of the transmission. And, all of this without interprocess communication! It is error prone and not well suited to infrequent users. What is needed is a more dynamic interface between micro and mainframe - one that reduces greatly the amount of specific knowledge required by the user, that permits better integration of functions, and at the same time increases the power and flexibility of the operations that can be performed.

Finally, the suggestion is that the pc(s) installed in our businesses are being used constructively or efficiently. To the best of our knowledge, there is no empirical evidence on this question. Given the amount of resources committed to pc(s) and related equipment (including software and especially staff time), it is questionable whether management would knowingly permit this

allocation of effort - but piecemeal acquisition and individual
level learning and implementation tend to escape cost-benefit
examinations. Another view, however, is that if a pc results in
productivity or role enhancement for its user, then it doesn't
make any difference whether or not the resource is efficiently
used. A pc used 10% of the time *may* be more effective than a
mainframe used 90% (this remains to be shown for the general
case). One does not become concerned about how efficiently a
typewriter or telephone is used; given the low opportunity cost,
such an emphasis would be misplaced.

EUC for Role Enhancement and Process Innovation

While the tools currently available for pc(s), for example
LOTUS 1-2-3, are definite improvements over those available on
mainframes, one gets the impression that they do not fit well the
way knowledge workers think. Our current tools appear too
structured and inflexible; we lack the generic tools that would
permit the *dynamic manipulation* of objects in unstructured and ad
hoc ways.

People appear to work with fragments of tasks, crafting them
and then stringing them together into finished products. Rather
than starting at the beginning and working through to the
conclusion of a problem, potential solutions often contribute to
problem definition. Current tools provide little support for

these cognitive activities. They facilitate the execution of well defined tasks but do not support innovative task activities or augmented intellectual work.

Another difficulty with present tools is that they require a formal statement of the problem. 'If one can formalize a problem, then this is often equivalent to shifting it from an unstructured to a structured form. Solution, at this point, may not even be necessary. The mismatch between the formal requirements of problem statement and the ad hoc, intuitive way that problems are identified and dealt with in real organizational settings, prompted one of the panelists to observe, "*real* men don't compute." The issue, then, is how computers can be made to work for people; how they can be used to transform tasks in ways that make them easier to perform, how they can be used to facilitate learning.

This suggests a reexamination of office work, one that focuses on work primitives and cognitive processes. Given a different vocabulary of office work it may be possible to create tools that more directly support human thought.

Flexibility

A great deal of effort goes into the design of large data base and teleprocessing systems. Will these operational systems

be able to support EUC as end users conceive it? Can they

provide support in a flexible, personalized manner with the end

user in control of the process? Or are we heading for another

major misunderstanding, similar to what occurred with Management

Information Systems (MIS)?   .

Will the model of EUC create false expectations that will

further erode the position of the central Information Services

staff and the credibility of the technology? What can be done

with large operational systems to make them support better the

"ad hoc" querying and unstructured requests of end users? Today,

this shortfall is taken up by the Information Center. In the

future the gap will have to be closed through changes in

operational systems.

Rather than considering EUC a fluke, just a different

manifestation of the same mainframe computing we have all gotten

used to in our companies, it may be that there is something

really *new and unique* embodied in it. Consider the development

paradigm. With normal computing one uses a development

methodology involving identification of requirements followed by

building the system. In EUC, incremental prototyping is a real

alternative. The solution and the problem are interwoven; they

can not be separated. It is a far more *natural* development

process than the "life cycle." Why can't these implementation

techniques be used in the development of our large systems?

Shortfall in Strategic Decision Making

One current theme in the literature is the use of Information Technology (IT) to achieve a competitive advantage. Two issues stand out in this plausible scheme. First is the implication that the strategic planning process in most firms is an orderly, visible one and that consideration of the opportunities presented by IT need only be interjected at some appropriate point in order for full advantage of the technology to be taken. The second is that top management is willing and able to weight the opportunities and risks associated with IT.

Experience has shown that strategic planning is often diffuse and covert; formal planners are vulnerable in difficult times. With such an obscure process it is hard to introduce consideration of IT. Top management is notoriously poor at entertaining options they do not fully understand and there is little indication they have a good grasp of IT. One way that the pc may be helpful is in serving as a metaphor for new technology - apart from any substantive the planners may use them for, pc(s) can provide some hands-on experiences with actual systems they would otherwise lack.

While it is all well and good to identify worthwhile goals,

for example, identifying a new product or service that IT will be used to create [Porter 85], little has been written about how these initiatives are accomplished. The messy problems of translating goals into programs that, when executed, achieve the original ends plus overcoming resistance to change still remain. There is not much in the literature about how a particular thrust came about or the fabric of implementation (for exceptions see [Bikson 85] and [Turner 85]).

Conclusion

There are many misconceptions about end user computing: that it refers mainly to pc(s), that it is new and that it is going to resolve many deeply seeded problems with technology. What is truly exciting about EUC is that it more closely matches the way people naturally perform information-based tasks than do large, centralized systems. Rather than molding EUC to conform to the way large systems are managed currently, we must be sensitive to the innovations that often appear when people are given appropriate tools to do their jobs and remove unnecessary constraints. EUC may well show the way to a rethinking of our approach in building large systems.

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