MYTHS AND REALITIES OF ON-LINE INFORMATION UTILITIES AND ITS NETWORKING

Emin Doğan AYDIN (Ph.D.)
Asst. Prof. of Informatics & Computer Science
MARMARA UNIVERSITY
Faculty of Communications

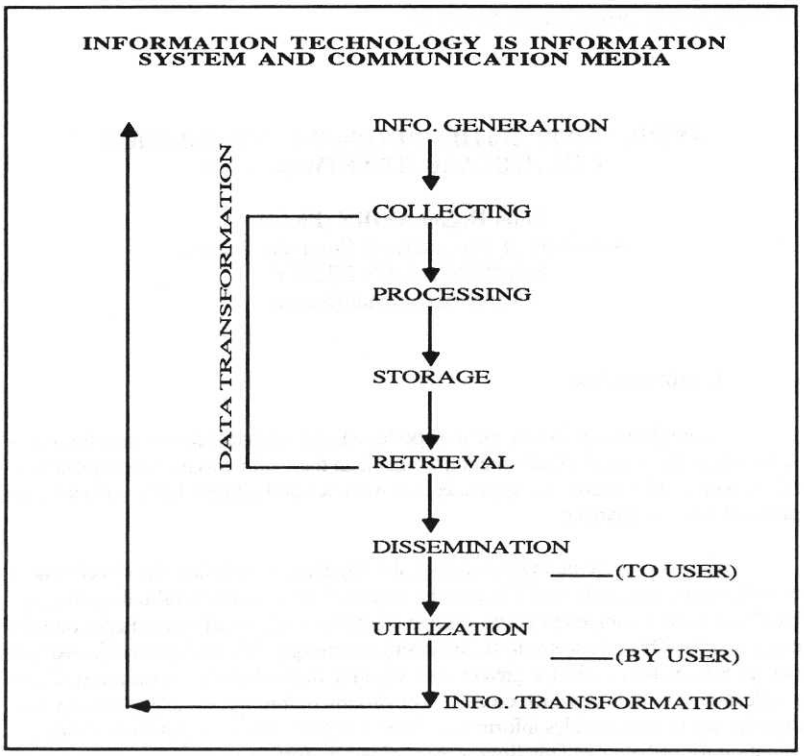
1. Introduction

Many years ago, before air transportation and electrical communications were invented, the amount of information available in the world was manageable and the rate at which information was generated and used leisurely. Since 1950, however, the picture has been changed.

The pace of technological change, the population explosion, the development of audiovisual materials, and TV, and the impact of communications and micrographics have been combined to produce huge amounts of information at a faster rate for more people. This rate seems to be increasing alarmingly. Man today is subjected to a rate of information exchange greater than anything he previously experienced. Communication technology which creates an environment through the use of various media of transmission, enables information flow as it proceeds from generation to dissemination for utilization. This flow is maintained by further generation and re-use of previously generated information. The flow utilization to generation which certainly exists through, is not clearly understand. The flow from generation to utilization is the kind of transmission which we are explicitly dealing with. (see following figure) In fact, the information pace is rising so rapidly that most of us cannot begin to comprehend its present and future impact on every aspect of our lives.

Developing effective on-line information systems and networks is very vital. It isn't enough just to make information available to people; in order to be useful, the information must also be relevant, timely, and of special value to the person who receives it.

The number of domestic and specially global networks for information, for computers, for communications, is continuously expanding, but there exist not quite right on-line information utility; and networking is increasingly becoming mission critical. This work strategy applied through which the most important things to present some of the specifications and recommendations; rather the main emphasis to put on intelligibility or an attempt at "asking the appropriate and right questions", to list a number of possible issues, goals, criteria, constraints, plans, development potentials, and also recommendations. The reader should keep in mind that what is said belowisintended to serve as an itemized checklist as well as a text.



2. Issue and Scope

The objectives of networking, as perceived by user needs, are to exploit on-line information resources in order to solve problems, make decisions, and satisfy inquiry. The utility meets this demand by effecting the communication of on-line information.

To arrive at a network there must be an ongoing parallel execution of the following developmental steps, which are unconditional precedents before an on-line information utility can be achieved: planning; analysis/design; operational implementation; marketing and service promotion; education and training.

There will be no on-line information utilities for the next coming years, at least not on a worldwide scale. This is obvious since the planning, analysis, implementation, marketing, and education are **prerequisite stages** to an on-line information utility, and each requires at least some years of development.

There exist different kinds of networks:

On-line information networks are linked data bases or interlinked libraries which store items.

Computer networks have the facility of time sharing and the connecting of CPUs.

Communication networks are ways of connecting users. They have more outlets for the users (service stations) than information or computer networks.

On-line information utility is the result of **network hybrids**. There is usually a merging of storage and processing facilities; however, this may be just symptomatic of a need for improving the communication for an on-line information utility.

When talking of network design, specially to joint **worldwide networks** particular emphasis must be given to each country. No country has the same degree of development in present communication systems. Telephone lines in developed countries and developing countries vary in degree of access, overload, and serviceability. Global networking is a matter of finding methodologies for coping with the **existing nonsystem** on a worldwide basis.

Cost-effectiveness must be ascertained by determining traffic and frequency of use, that is, what will be the volume of users and user requests to the utility. **Cost-benefits** will be determined by how well the utility closes the loops between seeker and sink/source in providing service and significant information.

2.1. Criteria of an On-line Information Utility

Defined through its properties, an on-line information utility is a public service and convenience; it has serviceability and ease of accessibility; it charges a fee and is situation-dependent.

Often the utility is viewed as an information-transfer or communication device, but it is also a resource-sharing network.

Situation-dependency is a main criterion for the planning of an on-line information utility. This can be interpreted as the necessity to perceive the outer and inner environment in which the utility will exist and entails a number of constraints.

2.3. Constraints of/on an On-line Information Utility

2.3.1. Constraints on the User are in the Quality of Service:

. **Acessibility:** Is it direct or indirect?

. **Output media:** Are they suitable or desirable?

. **Availability-input (data base):** Which levels are available?

. **Operational:** Immediate decisions,

. **Tactical:** Short-term decisions,

. **Strategic:** Long-term decisions.

. **Need for intermediary:** Is it necessary to perform interpretation of queiry from user to utility?

. **Charge:** Is it within reach of user?

. **Delivery time:** Are there long delays or is the service rapid?

. Is **an alerting** or **awareness** service offered?

2.3.2. Constraint on the Utility come from user demands, as users perceive their needs (user awareness); so a distinction must be made between, on the one hand, discipline-oriented information, mission-oriented information, and dedicated packages of information, all of which generally provide only the building blocks for long range planning for undertakings; and the other hand, **action-oriented information**, all of which generally provide only the building blocks for longrange planning or undertakings; and on the other hand, action-oriented information which provides short-term action for a user who is operating under pressure to make a fast , vital, and final decision.

2.3.3. Legal Constraints: Regulating bodies, copyright, invasion of privacy, misinformation, and antitrust.

2.3.4. Market Constraints: Because of cost constraints self-sufficency may be unattainable. The utility must have a marketable service and eventually profit potentials. The competion offer pluralistic opportunities.

2.3.5. Internal Constaints are know-how, planning capability, design capability, and implementatinon, the ability to determine the function and organization of networks and the cost involved. These constraints will be determined by solutions to the following:

. How can graceful degradation of systems be achieved?

. Who are the major players of information networks instrumentation?

. How are systems applications to be integrated?

. How should integrate the management of various communication forms such as voice, data, video, and word?

. In closing the loops how can the **cybernetic approach** and **general system theory** best be applied and what kind of retrieval technique will be employed?

. What type of managements is needed?

. What are the principle directions for network management?

. What is network management in both a broad and narrow sense?

. What is the cost-accounting look like?

. What king of constraints (e.g., cot, performance, service level) have to be taken into consideration?

From the beginning, what evaluative techniques is employed as part of the overall design?

2.4. Planning Toward On-line information Utility

Work toward the development of networks for the individual user, institutions, and government at the local, regional, national, and international level will have to be **pluralistic.**

Proposed planning should be done by defining an entire and heterogeneous population of users. The most likely network will be an evolving or evolutionary **distributed** network.

2.5. Key Issues of On-line information Networking

When is such networking feasible and what is desirable?

Defined by user needs and benefits expected, what function or functions does the network perform? How can priority among many functions be determined?

What kind of structural organization will answer the two preceding questions?

Should the organization of networking be centralized- decentralized or distributive?

How can the public made cognizant of its need for service form a utility? It is important to stress the benefits to be derived and, as a consequence, develop motivation directed toward use and payment thereof.

It is possible that it will be long before networks are able to benefit a general heterogeneous population of users; therefore, it makes sense to do the possible and focus on **special-purpose** networks with well-defined tasks.

An overall multipurpose net service creates complexities of input and output, making organization difficult; thus, there is more reason for focusing on special-pur-

pose nets. Otherwise, for supporting certain applications, even more complex services are required. A few examples are indenfied in the following figure and in the related table.

Input \ Output	Video	Data	Voice	Facsimile
Video	Television 1	Radar Analaysis 2	Surveillance System 3	Freeze Frame Video 4
Data	Computer Aided Design Videotex 5	Data Processing 6	Voice Response Credit Autor 7	Hard - Copy Terminal 8
Voice	Voice-Actuated System 9	Voice Compression and Storage 10	Phone, Voice Mail 11	Voice-Actuated System 12
Facsimile (Word and Fixed Image)	Computer Aided Design Videotex 13	Pattern Recognition 14	Voice Response (Output) 15	Document Trasmission 16

Teleconferencing : 1, 9, 10, 11, 16
Computer Aided Design : 5, 6, 13, 14
Credit Author : 10, 11, 14, 15, 16
Videotex : 5, 6, 11, 13

Mixed Services

The following table defines all cells of above figure:

1. *Television*..... : Video-Video with expected quality and bandwidth
2. *Radar Analysis*.....: Video-Data for military applications, in particular
3. *Surveillance systems*.....: Voice-Voice for supervising installations including alarm and alert management
4. *Freeze-frame video*.....: Video-fax for transmitting information framewise
5. *CAD-Videotex*.....: Data-Video for information distribution
6. *Data-processing*.....: Data-Data for processing information
7. *Voice response credit author:* Data-Voice for output processing or decision-making results
8. *Hard-copy terminal*.....: Data-fax for displaying and storing data displays on paper
9. *Voice-actuated system*.....: Voice-Video, using voice as a trigger for displaying and distributing information

10. Voice compression and storage.....: Voice-Data for storing voice-based information in computing systems

11. Phone, voice mail..... : Voice-Voice for straight or delayed transmission of voice

12. Voice actuated system.....: Voice-Fax, see item 9

13. CAD, videotex.....: Fax-Video, see item 5

14. Pattern recognition.....: Fax-Data for analyzing word or fixed images using data output for results

15. Voice response.....: Fax-Voice, whereby voice output will be triggered by fax

16. Document transmission.....: Fax-Fax for serving office automation in particular

There exists the design problem of suiting the form and structure of a network to its input/output, content, and user benefits (i.e., what kind of linkage for what kind of on-line information for what type of user).

What are the legal problems that must be dealt with (see paragraph on legal constraints)?

The timing of implementation must not be too premature for the costs and availability of inputs, nor too late, to circumvent a steadily worsening information need.

The media for output and the right mix may be determined from the comparative merits of varying communication devices.

Not least of problems is that of determining the priority for the type of data base **action-oriented information** having high priority.

Experimentation through the planning of pilot alteration networks is essential for the enduring success of any conceived network for a given environmental situation and perceived user population.

Relay switches and referral directories is needed to determine who has got how much of what, where, when, and for whom?

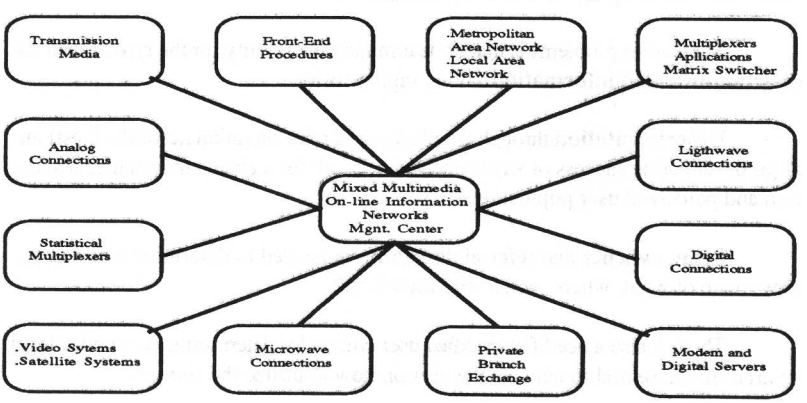
There is also a need for specified user criteria for determining the service level desired; it is essential to educate the user on how to utilize the service.

Bidirectional referral is needed. Furthermore, there is a need for **evaluation** of how well the loop is being closed in order to determine utility effectiveness.

Cost is related to the user in **what it saves him-time!**

2.6. Development Toward On-line Information Utility

Overemphasis on computerized symbol manipulation and numbers may tie down the present developed countries to dated "Gutenbergian" media, while intuitive human communication may be advancing in developing countries given appropriate mixed multimedia, AV communications, bidirectional CATV, picturephones, etc. Network users' motivation and patience will have to be maintained by **serviceability**, **convenience**, and "fun" means of avoiding the threatening introduction of number-coded names, zip codes, social- security numbers, employee numbers, etc. (There are for too many views about the network, as shown in the following figure resulting in conflicting and contradictory naming and addresing structures). There is a risk that some governments may never allow large-scale, **real-world experiments** in network communication, but would rather safeguard established routines and vested interests by appointing small-staff or one-man investigations for in-house action-taking. Resources may be exhausted by the building of data bases of assumed but nonverified usefulness, and the past history of libraries would be reexperienced again in some countries. In some countries bureaucrats and civil servants (by the thousands) may show up and claim themselves to be information experts by virtue of their first job appointment. **Trained information scientists** may be suppressed as members of an undistinguishable minority group, a subset of "computerniks." This may well happen if information science does not become a **worldwide professional discipline**. Introduction into the corporate organization positions such as Executive Director or Vice President of Information may be the only cure. The basic science and practices of on-line information networking may become absorbed in or drowned by such traditional disciplines as sociology, library service, economics, education, or applied mathematics. In the way there would be no identifiable group of information professionals.



Mixed Multimedia On-line Information Networks

It has been claimed that United States society has escaped from "the white collar proletariat." In some of the old socialist countries the use of goverment-owned computers will lead to a monolithically controlled bureaucracy and a totalitarian,

nonproductive, economically destructive growth of the administration and body politic. If this sort of threatens, **bidirectional telecommunication** across all borders should be fostered globally.

Under conditions of limited resources a balance should be kept between the three issues of information, telecommunications, and computer processing/storage. This balance should guarantee that equal efforts go into the research and development of these areas in **exporatory** term before normative steps are undertaken. If a balanced progress cannot be guaranteed, a piecemeal approach should have the following provisions for the three issues:

2.6.1. Bidirectional **mixed-multimedia** telecommunications (i.e., picturephones, CATV, home use, "narrow casting") by the use of multipoint person-to-person satellite transmission.

2.6.2. Research toward the formalization of **theories in information science** to gain insight, foresight, and hindsight. Nondesirable effects of filtered messages should be excluded.

2.6.3. Implementation of innovative processing and storage artifacts such as computers, data bases, or **knowledge-backup** facilities, in contrast to the traditional libraries and archives.

There should be **competition** between public and private services. Public services should be given priority over private services and governmental privileges because of the profound benefits to all of society through; (a)participatory-democracy possibilities via on-line voting, and (b) the possibilities of enhancing human intelligence via lifelong education and participatory social planning.

Action is needed how before industry or government takes complete command of networks and services on exclusive profit and regulatory-control bases.

The widespread use of a utility in the home will depend on how well it is marketed and how people are educated (i.e., are convinced of its efficacy in dealing with their needs).

The distribution of data through a network implies a decrease of emphasis on collection and storage of data and an increased emphasis on analysis and interpretation. If networks are concerned only with the transfer of raw data, one may question reason for transfer.

People and not the hardware are of importance in networking!

A personal computer/console in everyone's home, with all the books in some

data base system, does not seem feasible until the year 2000. The only networks envisioned by the time, in which quite number of people will participate, will have special purposes and a limited number of possible operations. An airline reservation network has a very special purpose with a limited number of inputs, processing procedures, and outputs.

The term "on-line information utility" possesses several implications. It is associated with development of time sharing, in which answer can access a system any time he wants to, can interact with different data bases, and can use different programs, etc.

On-line information utility should be a transmission pathway for a **competitive service**. With regard to many of these services, the user is at the receiving end of the service and reacts to it.

3. Conclusion

It is possible to argue that the diffusion of network/data-base technologies is a certainty simply on the basis of the history of the diffusion of previous information-related innovations.

When describing the properties of networks (information, communication, computer) and on-line information utilities, one should include the **structure** and **evolutionary nature of networks** along with the feasibility and desiribility of their performance. One must distinguish between discipline- and mission-oriented information, which are only concerned with providing building blocks for future eventual action, and action-oriented information which is concerned with **fast, vital,** or **final** decisions. Priority should be given to **action-oriented information**. A network which provides this feature will initially have limited types of inputs, outputs, and operations.

One should instill a "network awareness" in the public before, during, and after the planning, designing, and implementation of a network in order to ensure its adequate use.

Planning will include emphasis on different environments as, e.g., the nature of developing countries; geographical, linguistic or socioeconomic idiosyncrasies; and vested interests.

Consideration of regulatory policies that may be initiated is requisite. **Emphasis must be on user constraints** as opposed to management criteria. In other words, serviceability, form of output, quality, convenience, timeliness, and presentation are just as important as switching, cost reduction, coverage, and response time.

4. Summary

We do not need to understand fully the nature of on-line information to build utilities. It may take a long time to fully understand the true nature of information, which is basically a **scientific** question. The problem of effecting information transfer is perceived as immediate and cannot wait much longer for solution.

The limitations on utilities are not those of technology; technology being well developed for the purpose. Crucial factors are cost and organization.

On-line information utilities will affect government operations very slowly, and this inertia will be accompanied by the following **risks.**

There are obvious risks if the possible centralization of existing fragmented and limited governmental utilities occurs, and there will be increased governmental control over all utilities; but on the other hand, information would be available on an unprecedented scale to the state and local authorities for decision making.

Simultaneous increase of regulatory control and governmental intervention in private industry may occur.

Most likely there will be an increase in legal problems concerning privacy, copyright, and the public right to know, as well as those of antitrusts versus monopoly.

Additional bureacracy developments will undoubtedly administer control.

Conflict could occur between governmental and private sectors because of their vested interests in maintaining the status quo.

There exists the risk of governmental control through propaganda.

On an international basis, goverments may be involved in further treaty arrangements regarding communications, and consequent problems of safeguarding national security.

On-line information utilities could change our present concepts of universities by making formal **education** available wherever the student happens to be present (at home or elsewhere), with the result that the physical identity of the educational establishments will disappear. On the other hand, the utility could enhance the present situation and avoid social isolation for the students. The last statement could be such a major issue that it would hopefully overshadow the listed risk factors.

Finally, information has no value until it is used. In other words, all information can be viewed as a figural something that can be stored, retrieved, and transmitted;

but at the same time it always has its origin in the knowledge of a person and finds its ultimate use in the service of a knowing person.

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