Working Paper

"UNORTHODOX" VIDEOTEX APPLICATIONS:

TELEPLAYING, TELEGAMBLING, TELESOFTWARE
AND TELECOMPUTING

.

H.A. Maurer
I. Sebestyen

December 1981
WP-81-161

**International Institute for Applied Systems Analysis
A-2361 Laxenburg, Austria**

"UNORTHODOX" VIDEOTEX APPLICATIONS:

TELEPLAYING, TELEGAMBLING, TELESOFTWARE
AND TELECOMPUTING

H.A. Maurer
I. Sebestyen

ABSTRACT

Telephone based videotex systems are slowly changing from systems
that permit only information retrieval and limited message sending based
on numeric, menu-type access methods to more sophisticated, multi-
user, interactive, transactional systems. This is partly due to the concept
of adding external computers to the videotex network and partly due to
the emergence of more intelligent terminals.

In this paper, four major application areas, which have been made
possible by these developments but have not yet received the attention
they merit, are discussed in some detail: teleplaying, telegambling,
telesoftware, and telecomputing.

We maintain, and try to demonstrate, that these four areas will signi-
ficantly influence the market penetration and social impact of videotex
systems.

CONTENTS

"UNORTHODOX" VIDEOTEX APPLICATIONS:

TELEPLAYING, TELEGAMBLING TELESOFTWARE
AND TELECOMPUTING

H.A. Maurer and I. Sebestyen

1. INTRODUCTION

Telephone-based videotex systems, which we will simply call videotex systems, have been in existence only since the end of the seventies. (See Woolfe 1980 and Maurer 1981 for general overviews).

Originating with Prestel in the UK, videotex systems were conceived primarily as information retrieval systems capable of limited interactivity using very simple, cheap terminals. Now the character of videotex is being changed by several recent developments: the introduction of "external computers" providing whatever interactive options the information provider wishes to make available in the FRG, the arrival of more advanced terminals (capable of local processing of graphic instructions) in Canada, and the introduction of alphabetic access techniques to French systems.

Important to the success of videotex systems will be the scope of their application. The addition of external computers and intelligent terminals greatly broadens the range of applications. In fact, many potential and important applications have yet to be recognized.

In this paper we focus attention on four new applications, which we feel will significantly influence the spread of videotex and its impact on society: teleplaying, telegambling, telesoftware, and telecomputing.

Teleplaying refers to the fact that videotex allows the realization of complex multi-person games whose appeal may be comparable to that of TV shows. Telegambling refers to a special category of teleplaying. Telesoftware refers to the fact that a videotex system can be used to

store programs that can be downloaded into the user's terminal and executed there, opening up the potential for a multitude of fascinating applications. Telecomputing refers to the fact that the gateway function may allow access to computational centers by videotex terminals.

Although all of the currently available videotex systems claim to be interactive, many of them--such as the best known system PRESTEL--offer only rather rudimentary interactive possibilities. Beyond recall of the frame is desired, interactions are typically limited to a simple version of electronic messaging (in Prestel systems, via so-called "response frames").

It is widely recognized that videotex will only develop its full potential and have its full impact if it becomes a truly interactive service, with facilities beyond the retrieval and messaging functions. Since videotex centers cannot be expected to handle thousands of complex interactive processes simultaneously, it is generally accepted that full interaction must involve so-called external ("third party") computers. Such external computers (together with executable software) are provided and operated by information providers and are connected to the main videotex computers within a (usually packet-switched) computer network. A user accesses the external computer through the nearest videotex center which acts as a gateway.

The above concept was first realized in the FRG videotex system ("Bildschirmtext-Rechnerverbund") in 1980; it was also implemented in the French pilot trial (Teletel) where it has been operational since the summer of 1981, and it will be available in other countries (including Austria) in 1982. Since the German system is the only one with which some experience has been accumulated, comments on the use of external computers in videotex systems will refer to the situation in the FRG.

External computers are presently being used[1] almost exclusively for three major applications: for booking purposes (by mail-order companies and travel agents), for monetary transactions (by banks), and for software experiments (by computer manufacturers). Although these applications are well-suited for external computers in a videotex system and are indeed very popular[2], many obvious applications for external computers have yet to be tried out, among them services such as income tax or mortgage calculations, highly interactive information retrieval applications, operations research applications or timetable creation based on user needs, etc.

---

[1] The distribution of the 14 currently active external computers in the FRG is as follows: banks(4), catalogue sales(4), travel offices(2), computer manufacturers(3), videotex service office(1).

[2] One of the four banks providing an external computer reports over 1200 new "electronic customers," i.e., more than 20% of the total number of participants in the pilot trial!

2. TELEPLAYING

An area we want to examine more closely is teleplaying. In teleplaying, the external computer provides software for playing games with one, a few, or a very large number of participants. The significance of teleplaying lie in its social component and in the fact that it may help not only to strengthen existing personal ties but also to establish new contacts. As has been observed by Maurer (1981), the telephone network has not traditionally been an instrument for making acquaintances. The notion of multi-person telegames may change this. But before discussing the still "unorthodox" multi-person telegame, we will review briefly more "orthodox" kinds of games made feasible by external computers in a videotex system.

An external computer can play the role of an opponent in most two-person card or board games, such as chess, go, Superbrain, and so on. However, we do not feel that such applications will be very important (except for "resource sharing" purposes) as they are usually better handled by local microprocessors (in the user's home), either by loading them with suitable software from, say, a tapedeck or (more to the point) from a videotex computer as telesoftware. (We will return to the latter point in Section 4.) In passing we note that external computers cannot be used to play the games of manual skill and reaction time known as TV games (using some game control paddles) or available in Penny Arcades (such as "Invaders," "Little-Brick-Out," etc.). The response times between the external computer and the communication network and the user[3] is both too long and too unpredictable.

Another kind of telegame for which we do feel external computers are useful is the one in which the computer does not act as player, but as administrator, referee, and provider of the tools necessary for the game. Suppose two persons A and B in different locations[4] want to play a game of chess. After having agreed on a starting time (using the videotex message service), they log into the same external computer via the videotex gateway and request the game chess. The computer displays a chess board with the initial configuration of pieces on both videotex terminals and proceeds to request moves in turn, checking them for legality and displaying the current situation on both screens at all times. Adjacent to the display of the board there is a portion of split screen allowing A and B to carry on some conversation (by exchanging messages). Many other features will be available also: the computer will keep a record of how much time was required by each player; it would permit the game to be interrupted for as long as desired (for a dinner, or till next month); it would keep track of all moves, which would allow a re-play and analysis of the game after its termination (in fact, it could even perform or help in the analysis); it could act as partner, especially for beginners, in a "teaching mode" (commenting on each move of the player, suggesting and allowing alternatives), etc.

---

[3] Switched telephone from the user to the videotex gateway computer, packet-switched data network from there to the external computer as typical solution.

[4] The tariff structure imposed for videotex will enter significantly. In countries (such as Austria) where only local call charges are levied for videotex usage independent of location, A and B may be hundreds of miles apart.

Clearly, this kind of setup is not restricted to two-person games, but applies to all kinds of games, including card games. E.g., in game of bridge, the computer would deal the cards, keep score, even fill in for a missing fourth player, if necessary. Again, many features not available in ordinary bridge might be available in this version: the possibility of analyzing a hand after the game; the possibility to ask for an "extraordinary deal" (i.e., an unlikely distribution of cards); the possibility of dealing the same set of cards to various groups of people ("duplicate bridge" on a large scale, so to speak!), etc.

Certainly the variations will not be limited to currently available games. New games (some involving a very large number of participants) will emerge. There might be a simulated stock market game with an arbitrary number of participants who "buy" and "sell" stock, manipulate the "prices" of stock, perhaps even using real money; there may be "rallys" that start at a certain time (e.g., Saturday evening at 8 p.m.), for which one has to pre-register and pay a registration fee, where one has to try to reach certain destinations (which can only be found by solving puzzles, answering questions, reacting in a certain way, and having a bit of luck) in order to obtain some prize, public recognition, or simply a particularly high score. The rally participant need not be one person, but could be a group of friends or a family unit, sitting around the same videotex terminal (maybe helped by other friends on other videotex terminals in some other location). This kind of joint, active participation contrasts favorably with the current passive and isolating TV-watching behavior that has greatly changed society over the last twenty years. The activities described may well help to dilute the activity—and communication-stifling influence of modern one-way media. We might see here one more instance of advanced technology helping to overcome negative side effects of some earlier technology.

Here we come to the point made earlier, that game and entertainment activities on external computers in videotex systems may help one to establish contact and communicate with persons with whom one would not have otherwise been involved, much in the same way as this happens over citizen band radio.

Let us consider some concrete examples of the type of situation we envisage. In a rally with many participants, the software may well provide players with knowledge about how other participants are doing and possibilities for communicating with them, or even allow them to join forces for part of the undertaking. On a simpler level, let us imagine a program that allows people to walk around in a maze, choosing a cover name, and meeting each other as they try to find an exit, a mystery place, treasure, etc.

As they meet, they could exchange messages which, starting with greetings, information on the maze ("that bridge leads into a cul-de-sac" or "my friend is waiting for me at the big oak tree, but I can't find it--do you know how to get there?"), and standard conversation, may lead to agreeing on a rendevous in the maze ("this was fun, Mazy-one. Lets try to find another mystery spot together some time" or "O.K. Sue, let's meet tomorrow at 3 p.m. at the entrance of the maze") or even lead to revealing one's real identify and a get-together in real life. Or there might be a

super cross word puzzle that can only be solved through the joint effort of people from all walks of life. (In one scenario, anybody may participate, but his entry would only be accepted by the program if it is correct; his contribution would then be recorded and a prize would be awarded to the participants who contributed the most. Or there might be a competition in drawing pictures or inventing a limerick, or there could be a strategy game between two opposing groups of people.

We hope to have demonstrated that the possibilities are virtually limitless. A whole new entertainment and game industry based on videotex seems to us to be a very possible prospect. The social impact of activities of the kind mentioned could be substantial. The success of shows allowing for broad public involvement seems to indicate that our vision of mass participation in the electronic mass game currently *en vogue* is not so very far-fetched.

3. TELEGAMBLING

Telegambling, is a special class of telegaming. The appeal of gambling lies in the fact that the involvement of bets and money on one hand increases the excitement of gaming, and on the other hand, it gives some people the hope of becoming richer. Gambling is not new; it has existed throughout the history of mankind and will certainly continue to be with us.

From time to time, gambling has been condemned by different segment of society (such as churches) and promoted by others who were in a position to monopolize and/or tax upon it.

Practically all legislation affecting gambling has been antagonistic to it. According to English common law (27 Corpus Juris p.969) a game played for stakes was lawful if skill predominated, unlawful if chance predominated. Judgment on the status of a particular game was left to the court. According to the Encyclopaedia Brittanica, California courts have held draw poker to be a game of skill, stud poker not. One justice of the New York Supreme Court held duplicate bridge to be a game of chance, all others have held it to be a game of skill. For at lease 300 years there has been controversy over licensing and state control of gambling. In most countries some forms of gambling are permitted. Wherever gambling is lawful, it is taxed. In the United States professional gamblers are subject to federal taxation. Where betting is permitted, the tax is almost always a percentage of the gross amount and may range as high as 10% on horse or dog racing and even higher on lotteries.

Licensed "constitutionalized" forms of gambling can be found in practically all societies: "lotto", football-pool, state lottery, and racing are extremely popular in the UK, France, Germany, Austria, Hungary, Italy, Czechoslovakia and many other countries. In Hungary (total population 10 million) for example, week by week, 3 million lottery ("Lotto") tickets are sold. Football pool is extremely popular as well. When some additional funds have to be raised--for example to support the participation of the national athletic team of the next Olympics, a "dedicated" lottery game will be initiated by the government in order to raise the funds required. Characteristic of these national gambling games is that, in

most cases, the government is involved to some extent. Either it has a nationwide monopoly, or at least they enjoy collecting extremely high tax revenues from the income made by national or private enterprises.

In many countries gambling has become a huge industry. For example, in 1979, gambling casinos in the UK had a revenues of £185 million (≈ US$ 280 million). And this amount shows an annual growth of 10.2% (Predicast World Cast P-1 1981). Similarly, the gambling industries in Las Vegas and Monte Carlo cannot complain about low earnings.

According to the Encyclopaedia Brittanica, it has been estimated that during the 1960s the total amount bet in gambling games in the United States alone approximated US$ 50 billion (!) each year; that in England 48% of the adult population risked some money by gambling; and that throughout the world the amounts risked annually approached 6.66% of personal income.

By comparison, only about 5% of personal income is spent on information (newspapers, TV and radio license fees, books, etc.). In fact, it is this portion of income that is expected to be redistributed after the introduction of information banks available through videotex services.

Back to gambling, it is estimated that the worldwide total of gambling losses to common or professional gamblers and the salaries of their employees, reached or exceeded US$ 25 billion. About 2,000,000 persons throughout the world, almost all of them entrepreneurs or employers in the gambling business, derived all or most of their livelihood from this source—according to Encyclopedia Brittanica.

(Would this mean that if videotex be used for gambling that many of the above "jobs" would be in danger...?)

This rather long introduction to gambling was needed in order to point out that whenever new opportunities for nationwide or local gambling arise, there are strong financial interests on the parts of most governments and some enterprises to enter this business and make as much money as possible. New information technologies such as videotex offer not only excellent opportunities in information retrieval, electronic fund transfer, electronic mail, teleplaying, etc. They can be "used" or "misused" for telegambling as well.

Let us examine a few "theoretical" examples:

a) Football pool: Football-pool is a traditional nationwide gambling game. For example, the Austrian newspaper *Kurier* reported in its issue of November 14, 1981 about a "Toto" boom in Austria (population 7.5 million) whereby Austrian pool players placed bets amounting to AS 20 million (US $1,3 million) for a single week-end. Another example: In Hungary, several hundred thousand football pool coupons are sold every week. The weekly pool guide "Turf" containing competitors' hint and a broad variety of football statistics is one of the country's best selling weekly papers. In Hungarian football pool, players bet on the outcome of 13 football games, with marking 1, 2, or x (first team, second team, tie). If all guesses are right, a separate guess on the 14th game can raise the value of the prize.

In a likely videotex version of football pool, players would place their bets into the videotex system by filling in an appropriate response frame. The access fee for the response frame would be equal to the price of one football pool coupon. Should the player require background information in order to determine the wisest selections, the "electronic" (videotex) version of the pool's guide could be accessed to retrieve the necessary information, such as statistics or time series of previous games. Bets could be placed until the first football match contained in the pool begins. If a player wins his prize could be transferred to his bank account by the electronic fund transfer service of videotex.

b)   "Lotto": A class of state lottery--often called "Lotto"--is in Hungary, for example, even more popular than the football pool "Toto". Week after week 3-4 million coupons are sold throughout the country. The drawing of the lottery numbers (five out of 90) takes place every Friday at 11 o'clock; many in the country await with excitement the results of the draw.

   "Lotto" could be put on videotex in a fashion similar to the previously mentioned football pool. There is one major advantage of the videotex supported version of this game: namely, its ability to support and speed up the process of evaluating and checking the lottery and football pool coupons, which could be done automatically by an external computer. This process is still being done manually: more than one hundred workers take a full day and night to select the winning coupons. Through videotex the whole process could be completed within minutes and the exact sums of the prizes determined. In principal, it would also be possible to hold daily lotto drawings.

c)   Lottery: Another class of state lottery is represented by the North West German State Lottery, which runs over a period of six months with drawing per month. In this particular lottery there are 300,000 tickets with 107,858 prizes totaling over 103 million German Marks (DM). Players order their coupons by mail; within days, they are sent tickets and invoices. After each "class" (drawing) players receive the official winning list by mail together with a ticket for the next drawing. Notification of winning tickets is sent to the lucky players. Winning tickets are eliminated from the game and the prize money is transferred to the winners within about one week.

   The game described above could be put relatively easily on an external computer of a videotex network. By on-line request for coupons a random number generator program run on the external computer could select a coupon for the player. The external computer would administer the coupons, and the corresponding players and the drawing could again be done by means of the random number generator program. Selection and notification of the winners would be done automatically. The collection of money for the coupons and the distribution of the prizes could be done by the electronic fund transfer function of videotex.

d) "Teleroulette."--"Teleblackjack": Games such as roulette or blackjack could also be put on videotex network on a nationwide basis. An external computer performing all the functions of the "bank" could easily be programmed and put into operation. Players could place their bets at any time of day and many players could access this special "third-party" computer simultaneously. Administration of the game and the addition or deduction of money could also be done automatically. Necessary fund transfers between users' bank accounts and the roulette or blackjack center could be carried out through the electronic fund transfer function of videotex. Placing the bets would be done in an interactive way. The computer would ask for the placing of bets, users would type in their bets, say "$10 on the second dozen," or "$5 on number 36," etc. Then the bets would be closed, and a random number generator program would select a number between 0 and 36. Then the computer would determines the losers and winners. Electronic fund transfer to the bank accounts of the winner could then be initiated.

e) "One-armed bandit" through Videotex: An early version of the slot machine or "one-armed bandit" was invented by Charles Fey of San Francisco in 1895: he called his machine the "Liberty Bell" and rented it to a local saloon on a 50-50 basis. Another version of the invention was developed by H.S. Mills, who set up his factory in 1889. By 1932 his company was making 70,000 machines a year. This seemingly harmless attraction is in fact big business: according to the Encyclopaedia Brittanica (1967) the town of Las Vegas (population, 70,000) has 10,000 licensed slot machines. The owners pay a tax of US $250 per year on each machine to the Internal Revenue Service, plus an income based tax to the state. In 1932 "Fortune" exposed the profits made from a respectable business that only sold the machines: it quoted the turnover on slot machines for 1931 as US $20 million for greater New York alone, and US$ 150 million for the whole of the USA. It was calculated that on the average machine, 1,000 games at a total cost of $250 would return $61.75, leaving a profit of $188.25 (Edward de Bono 1974). Early models were followed by more sophisticated ones.

Obviously it would be technically feasible for an external videotex computer to perform the function of an armada of "one-armed bandits" Such a computer could easily take the bets, run a random number generator program, run the game, and check the bets against the generated result. Finally, any transfer of funds could be done by the videotex system itself.

The class of gambling games in this category could obviously be as broad as one finds at present in casinos anywhere in the world.

f) Horse racing through videotex: Betting on the result of a horse race is a principal form of gambling. Because it is universally taxed, it is the only form on which audited statistics are always available.

In the late 1960s, betting approached an annual volume of US $5 billion in the US and £300 million in the UK (Encyclopaedia Britannica). Surprisingly, more money was bet through bookmakers than at the track. In the UK, where bookmaking is licensed, the amount bet through bookkeepers is about twice that bet at the race tracks. Thus there are good chances for videotex supported bets on horse racing(!).

In addition, wherever horse racing is popular, it has become big business, with its own newspapers and other periodicals, extensive statistical services, self-styled experts who sell advice on how to bet, and networks of telephone and telegraph wires that furnish information to betting centers, bookmakers and their employees, and workers around the horses and stables.

A videotex-supported information bank could provide an invaluable service in collecting, organizing, and storing the above "valuable" information.

From the technical point of view electronic betting on horse-racing could be done in the following way: bets on the horses could be placed in the same way as in any booking office, practically until the start of each run. Before placing his bets, the player could request statistics, chances, and biographies of horses and jockeys via videotex information banks. After each run an external computer would appraise the results on-the-spot and notify the winners and losers. Transfer of money would be enhanced through the electronic fund transfer capability of the system. In a more advanced version a dedicated cable TV-channel could report live on the events around the stables and at the tracks.

The list of gambling games that could be played on videotex is practically endless. Here we only attempted to points out the potential of this videotex application and show that videotex-supported gambling is feasible from the technical point of view. Many questions remain open, however, such as whether or not it is desirable from society's view point.

Let us assume that it is. In this case what kind of data security measures would have to be taken in order to assure that, for example, children do not get access to the system even if they should get hold of their parent's user name and password? Or what should happen if an adult is addicted to gambling and does not care whether he loses his monthly salary within a few hours...?

And last but not least, there is another important aspect of telegaming and telegambling. The social role of gaming and gambling is and should not be primarily to win or make money. The more important role of these activities is to bring people together while entertaining them and thereby to provide the precondition for establishing human contacts; for

creating opportunities for serious and less serious chats, talks, and discussions; for making new friendships and maintaining old ones, or for simply getting away from the daily rut. Whether or not the interactive capability of videotex is adequate for these purposes has yet to be proved. The picture of a pub at the next corner where regular visitors would gather around the same table every Wednesday and Friday and drink their usual beer or wine, and where a card game would follow a certain, well-prescribed ceremony is, from the psychological point of view, not quite the same as starting an "random number generator program" and an "automatic card distribution" routine. The manner of playing a certain game--according to the cards in one's hand--cannot be expressed in the same way if one plays it through videotex since one cannot show one's temper, one's happiness about the game, one's cleverness in playing the game, or one's resentment about a bad hand. Also, the usual "background chats" while playing would disappear to a great extent. What would happen to the "kibitzer" watching others playing their cards. (Although technically this is also possible on videotex, would they be prepared to do so?)

Thus there is a fear that videotex-supported gaming and gambling--although technically possible--cannot provide the same atmosphere one finds in a casino, in a pub, or among friends--in our view an essential part of this activity.

In order to be able to judge the potential impacts of videotex gaming and gambling on society and its role in entertainment many pilot trials— preferably with the inclusion of legislative aspects—should be carried out and evaluated. We should not be afraid of looking into this field more closely.

4. TELESOFTWARE

External computers are extensions of basic videotex at the information providers' end. It is also conceivable—but this has not yet been implemented in any current videotex system—to extend videotex at the users' end by providing intelligent terminals, i.e., terminals that can execute stored programs. The programs to be executed may have been created by the user, may have been loaded from a local external storage medium (like a tape-deck) or may have been loaded from the videotex systems. Such software, stored in the videotex system and "downloaded," similar to ordinary data but executed in the videotex terminal, is called telesoftware.

It is our contention that telesoftware is a viable alternative to program storage and distribution and that it will have a major influence on the spread of videotex penetration. Before we discuss the typical telesoftware that might be made available in the future, a number of technical and economical facts should be brought to mind.

Intelligent videotex decoders capable of handling telesoftware should be available by 1983 for about $500. Compared with the price of other electronic and media equipment competing for the same segment of households' budgets, this should be sufficiently low to allow significant market penetration. In addition to the cost factor, two other obstacles

have been responsible for the lack of decisive progress in the area of telesoftware. One is the question of programming language: since there is no universally accepted programming language for microprocessors, severe compatibility problems arise. (Note that even the use of a more or less standard language such as Mini Basic does not really solve the problem, since the non-standard input/output and graphics commands block cross-micro compatibility.)

It is quite possible that the existence of various "dialects" of a programming language will impose an additional burden on intelligent terminals. In that sense, countries where videotex developments are controlled centrally and rigidly (such as France) are most likely to be able to overcome compatibility problems.

The second obstacle is transmission speed. Due to the essential need to check for transmission errors when loading executable programs, the down-loading of a substantial program may require up to five minutes. A number of techniques for reducing the required transmission time are emerging, the most noteworthy of which are ideas for initiating program execution before the program is fully loaded and for separating text (such as in explanations and error messages) from the program itself, retrieving it from the videotex system only when needed. Thus despite the obstacles presented by high terminal price, the need to standardize programming languages, and the need to shorten loading times, it is foreseeable that telesoftware will become a workable option.

The appeal of telesoftware and its underlying concept lies in the fact that a user, without requiring any external storage device at home (likely to develop occasional mechanical problems) nevertheless has access to virtually unlimited random access storage within the videotex system: user programs, user data, and programs and data from other sources are all available within the system. Indeed, videotex may offer an optimal means of distributing software to the residential and small business market. New software releases could replace obsolete ones without the user even noticing.

The wide range of potential telesoftware can be roughly divided into five categories:

(i) games and entertainments,

(ii) software for the residential market,

(iii) software for the business market,

(iv) videotex-related software, and

(v) systems software.

We will discuss each of the five categories in turn.

(i) Games and Entertainment

Many of the game applications mentioned in Section 2 under teleplaying (on an external computer) could also apply to the local computer, i.e., the intelligent terminal, if it is down-loaded with the appropriate software.

Indeed, the intelligent terminal is a better solution in a number of instances. This is true first of the Penny Arcade-variety of games of skill, which cannot be realized with external computers as explained earlier. We believe that even multi-person games of skill requiring half a dozen or so game controls can be implemented using telesoftware and have substantial relaxation and entertainment value, something that has been overlooked so far. Secondly, it is true for those games in which one person plays against the computer. The down-loading of a chess program with its subsequent execution, independent of the videotex network is more reasonable alternative to tying up the computing power of an external computer and requiring an open telephone line and port at all time.

More surprisingly, even games involving a number of people at different locations can often be accomplished using intelligent terminals rather than an external computer, even if no messaging is supported (as in some rudimentary Prestel versions). To explain how this works, consider the case of two persons A and B wishing to play a game of chess. A and B choose a frame n_A and n_B, respectively, which they are entitled to edit (observe that $n_A=n_B$ is *not* possible in most videotex systems) and inform each other of the frame number and enter download the chess program. Both A and B enter the frame numbers of n_A and n_B. For the sake of explanation, A's program requests a first move from A, carries out that move on A's screen and enters the move with appropriate code on the frame n_A. B's program, which has been polling frame n_A every 10 seconds recognizes A's move, carries out that move on B's screen, prompts B for a move, carries out that move on B's screen, enters the move with appropriate code on the frame n_B, which A's program keeps polling, etc.

It should be clear that games involving more than two persons can be handled analogously. Thus, much of what has been described under teleplaying on external computers might apply to intelligent videotex terminals. Only the capabilities of such terminals will impose a certain limit.

(ii) Software for the Residential Market

Telesoftware (in addition to game programs mentioned above) in this area will include programs for "home economies" such as mortgage, installment payment, and income tax calculations; a package to evaluate a portfolio of stock; or program simulating a very sophisticated desk-top calculators; software for creative tasks like composing pictures from picture elements found in videotex or composing music, which can be played using an attachment to the intelligent terminal; etc.

A number of applications will use the videotex system "in the background" in an essential way: after a picture has been composed as mentioned above it might be stored in videotex and a request could be sent to a company to produce a slide, print, or poster from the frame deposited; or after having edited an address-file it might be sent off to some firm to prepare address labels; or after having edited a letter it might be sent off to an appropriate institution to print it and mail it to the designated address(es). The last possibility might be particularly useful if the PTTs involved hesitate to establish the videotex mail gateway proposed in

Maurer et al. (1981).

Clearly, the above list is not meant to be exhaustive; it is merely intended to give some clues to what might happen. We are well aware of the fact that for every application we can think of now there will be half a dozen nobody ever thought of emerging in the future.

(iii) Software for the Business Market

Assuming that the intelligent terminal is sufficiently well equipped, just about any software now available for commercial purposes may be made available via videotex as telesoftware. Even if terminals end up with a disc drive attached to them, maybe the most elegant way to re-write a floppy disc with a piece of systems software may be to load it from videotex rather than copy it from a master diskette (which would no longer be needed).

Again, the presumably good color graphic features of the videotex terminal and the videotex system as back-up will open up additional possibilities: the request to output drawings on fancy multi-color plotters not available in ordinary business environments; the possibility to load telesoftware permitting the use of a simple query language on a database; the automatic evaluation of videotex response frames; etc.

(iv) Videotex-Related Telesoftware

Among the units of telesoftware available on an intelligent videotex terminal, will be some that will make the use of the videotex system more convenient. Typical possibilities include software for marking frames for convenient recall later, for performing alphabetic searches based on a numeric menu-type index, for automatic polling of certain frames (e.g., to collect statistical data or to evaluate response frames) and, of course, for editing videotex pages. Although intelligent terminals will not allow all of the complex possibilities found in dedicated information provider systems, it seems quite likely that a reasonable amount of frame preparation and editing will be possible.

(v) Systems Software

As has been mentioned earlier, intelligent terminals may well be user programmable by the user. In this case telesoftware could include language systems, compilers, and supervisory systems to allow the user to work with a wide choice of languages and software systems.

5. TELECOMPUTING

In the previous chapter telesoftware was described at some length. Looking from the broader view of information technology, telesoftware is merely the transfer of data files containing "source" or "machine" computer programs from a videotex computer to the personal computers of end users. If, however, one regards videotex technology as "the cheap computer network for the man on the street," one should also consider a few more videotex application classes supporting computation in general (Figure 1). An external computer with a high computational capability linked by the "gateway" concept to the videotex network could perform time sharing or batch computations for users with simple modified TV sets using an extended alphanumerical keypad/board or for users whose own personal computers are connected to the videotex network. In the latter case, only those computations that cannot be performed locally would be carried out by the external computer by utilizing its bigger core and secondary storage capacity. Also in applications requiring some sort of special hardware or output device, based on the resource-sharing principle, external computers with appropriate peripherals would also be accessed. For example, a special high quality laser printer could be used to print text demanding high quality printing.

External computers could be used also for storing and maintaining "telesoftware". Thus, if one type of personal computer connected to the videotex network cannot understand the programming language "dialect" of a particular type of telesoftware stored on the system an appropriate "precompiler" run on an external computer could modify the telesoftware into the programming language "dialect" required.

The main application classes of telecomputing through videotex do not differ significantly from the application categories named for telesoftware. They can be divided into the same five categories:

— games and entertainments,
— computation and information processing for the residential market,
— computation and information processing for the business market,
— videotex related software,
— systems software.

The key to the success of telecomputing is user-friendliness. In order to reach the mass market in supporting computing and calculation the software of the dedicated external computers has to be extremely user-friendly. An important step toward improving the user-friendliness of computing has been made with the introduction of personal computers into the mass market. May of the programs available on "Apples," "Oranges," and "Grapes" perfectly satisfy the above requirement. Before introducing a large computational center attached to a videotex network, the lessons learned in the field of personal computer applications should be closely looked at and considered. Telecomputing will only be successful if it is easy to use and cheap.
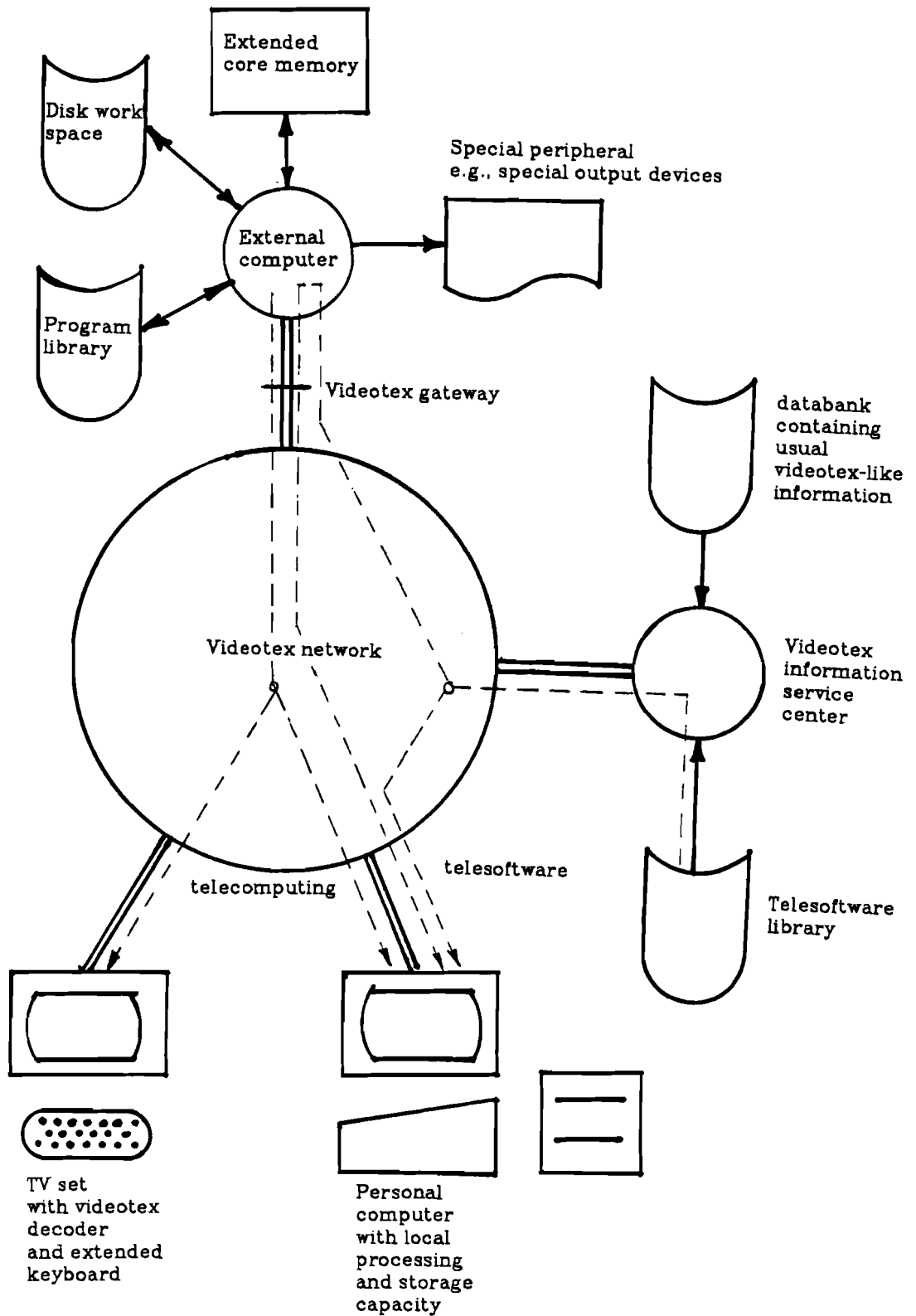
Figure 1. Major flow of information in "telesoftware" and "telecomputing" through a videotex network

4. CONCLUSION

In this paper we have argued that future videotex systems will differ significantly from the original numeric menu-driven information-retrieval-and response-page-only systems. They will include much local processing due to the use of intelligent terminals.

Those additional facilities will not only provide some of the standard services often mentioned in the literature (like direct booking, money transfer and enhanced graphics) but will also provide a spectrum of other possibilities which has not received much attention. Particular areas we have focused on are the areas of teleplaying, telesoftware, and telecomputing, all of which we believe will have a substantial impact both concerning penetration and societal impact of videotex.

We have not considered in depth the legal problems that may arise in connection with some of the more unorthodox applications: some of the multi-person telegames involving the possibility of winning prizes may conflict with games-of-luck laws in some countries and there might be numerous legal problems around telegambling; the message sending aspect emerging in many situations may violate some postal-laws; etc. Concerning such potential legal restrictions we do believe that, videotex being a new and unforeseen development, a number of laws may have to be modified to permit reasonable and useful applications of videotex. We also feel that pilot trials should be carried out while newly arising legal issues are under study.

REFERENCES

Edward de Bono. ed. 1974. Eureka! An Illustrated History of Inventions from the Wheel to the Computer. New York, Chicago, San Francisco: Hold, Rinehard and Winston.

Encyclopaedia Brittanica. Volume 9. Encyclopaedia Brittanica Inc.,

Maurer, H.A. 1981. Bildschirmtextaehnliche Systeme. Study prepared for the Austrian Federal Ministry for Science and Research.

Maurer, H.A., W. Rauch, and I. Sebestyen. 1981. Videotex Message Service Systems. WP-81-113. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Predicast World Cast P-1. 1981. Issue 62. Reference made to Financial W. 5/8/80. Ohio, USA: Predicast Inc. May 29.

Woolfe, R. 1980. Videotex--the new television/telephone information services. London: Heyden & Son Ltd.