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TELIDON AND EDUCATION:

SUMMARY OF RESEARCH AND FINDINGS

FROM THE TVONTARIO FIELD TRIAL

FORMATIVE EVALUATION 1981-1982

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by

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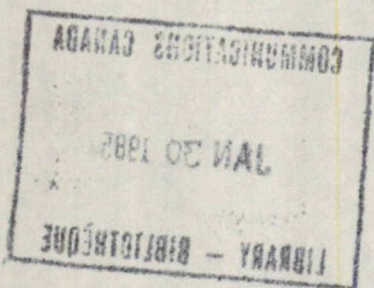Report No. 18 - 1982

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ABSTRACT 18 - 1982

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(TVOntario, Office of Project Research, Report No. 18-1982, 27 pp.}

A major research evaluation of Telidon in education has recently been completed. The study, based on the TVOntario field trial, examines how Telidon was used and explores the system's strengths and weaknesses in the educational applications undertaken.

Telidon, a videotex system that allows color graphics and text to be stored in a computer and displayed on a television set, was deployed in a major field trial administered by TVOntario. The trial involved more than 45 educational sites, including elementary and secondary schools, colleges, universities, libraries, and special institutions. A formative evaluation was conducted by the Office of Project Research to explore Telidon's impact and potential in education. The study was intended to provide information that could be applied to the continuing development of Telidon.

The research methods included: a survey of major participants; personal interviews and questionnaire surveys of students, teachers, and others involved in the field trial; observational data from extensive visits to the Telidon sites; and two in-depth studies of Telidon use at secondary schools, including a controlled study of educational effectiveness.

The research explored a variety of issues:

- How Telidon was used: the educational applications of Telidon that were attempted, differences among participating institutions, learning about Telidon versus learning with Telidon

- Factors affecting Telidon use: the effect of administrative patterns at each educational institution on Telidon use, the role of the Telidon coordinators at each participating institution, differences between experienced and inexperienced Telidon users

- Perceptions of Telidon: the interest and appeal Telidon generated among students, teachers, and others during the field trial, participants' feelings about Telidon's strengths, weaknesses, and possible future directions

- Technical issues: software - the branching structure, indexes; hardware - logging on, using the key pad, the speed of the system

- Sequence creation: the design, planning, and implementation of sequences for use in education

Research and findings are presented in two separately bound reports. The first contains a description of the field trial and research methods and a discussion of all findings of the formative evaluation:

Telidon and Education: A Formative Evaluation
  for the TVOntario Field Trial 1981-1982
  (Office of Project Research, Report No. 16 - 1982, 160 pp.}

This second report is an abridged version of the full report, featuring a synthesis and discussion of all findings.

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PREFACE

The research evaluation reported here, on the final year of the TVO field trial, 1981-82, was requested by the TVOntario Telidon project manager.

This report provides a summary of the field trial and research effort, gives an overview of the Telidon activity at participating institutions, and presents a synthesis and discussion of all data collected during the research evaluation. An appendix is included, containing a simple explanation of the Telidon page storage and retrieval system used in this field trial.

This report is based on the larger publication, <u>Telidon and Education: A Formative Evaluation for the TVOntario Field Trial, 1981-1982</u> (Office of Project Research, Report No. 16 - 1982).

The research team would like to thank all the members of the Telidon Project Team for their cooperation. A special thanks to Catherine Tait for her help in arranging testing sessions and providing much needed information. And most important, thanks to all participants in the field trial who gave their time and effort to the research team.

INTRODUCTION

Telidon is Canada's move into the videotex and teletext market. These technologies permit text and graphics to be stored in a computer and displayed on a television screen. Scientists at the Communications Research Centre in Ottawa developed what was considered to be a superior videotex system, naming it Telidon.[1]

Telidon permits the creation and transmission of color graphics that TVOntario management considered to be appropriate for educational applications. In 1978 the decision was made to explore these applications in a Telidon and Education field trial.

The Telidon system

This field trial used two Telidon modes - videotex and teletext. To operate in the videotex mode, a mainframe computer was connected by phone line to more than 45 terminals across Ontario. Each of the remote terminals had a decoder, a modem, a color television, and a numeric key pad. The key pad, which is about the size of a pocket calculator, allowed for interaction between the user and the distant host computer.

By entering a number on the key pad, a user could retrieve discrete "pages" (one TV screen) from the mainframe computer. These pages were arranged in what was called a branching-tree structure. The user was provided with

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1. Telidon graphics use an "alphageometric" code to store and display images on a screen. Instead of the "alphamosaic" type of code that fills in a grid of small rectangles on the screen, Telidon uses "picture description instructions" (PDIs) to build images out of geometric "primitives" such as point, line, polygon, etc.

"menu" pages, which direct him or her to further pages. Most of the pages were organized into series or "sequences" with one theme or topic or style (for instance: a game in which the user identifies the flags of many countries, or a lesson in geometry).

The Telidon hardware also operated in a wireless, teletext mode. In this mode, Telidon pages were transmitted through a spare capacity in the television broadcast signal (i.e., the lines above the TV image that the viewer may see when the picture, needing adjustment, rolls up or down).

In the teletext mode, a cycle of from 100 to 200 pages was broadcast continuously. The Telidon terminal "grabs" one page at a time into its local memory for display on the TV screen. The user could choose another page by entering a new number on the key pad and waiting for his/her terminal to retrieve it from the cycle.

TVO Telidon field trial

TVOntario is a crown corporation that is mandated to provide educational services to the people of Ontario, using televison and other media. With the announcement of the development of Telidon by the Department of Communications in Ottawa, TVOntario proposed to test both the technology and its applicability to education. The Telidon and Education field trial was born in 1978, funded mainly by the Department of Communications, but operated by TVOntario.

The Telidon project team, set up within TVO, invited educational institutions to participate in the field trial. Each institution was asked to create a Telidon sequence that would meet its educational needs. In

turn, these institutions received a Telidon terminal that allowed them to use their own sequence as well as those produced by other institutions.

The participating institutions fell into four categories: elementary and secondary schools; colleges of applied arts and technology (CAAT) and universities; public libraries; and special institutions (e.g., schools for the disabled).

Besides encouraging and supporting the production of pages from these local institutions, the Telidon project team also produced sequences for use by the field trial participants.

For the most part, all pages were produced by means of minicomputers, Norpak page creation terminals, at TVO's offices in Toronto. (These terminals were also called information provider systems or IPS terminals.) Once the pages in a sequence were produced on an IPS terminal, they were added to a "database" resident on a mainframe computer at the Department of Communications in Ottawa.

In this way participants throughout Ontario had access to a central database to which most had contributed a sequence. By the end of the field trial the TVOntario database consisted of approximately 60 sequences. Each sequence was unique, reflecting the producer's background and intentions.

Throughout the field trial the terminals had access to another database on the Department of Communications computer. This database consisted of general information including weather, news, national statistics, some computer games, etc. However, much of this information was often out of date and the branching structure and menu pages, though extensive, did not contain a great deal of information.

Later in the field trial much of the TVO database of educational sequences was replicated on the Bell Vista computer in Toronto. The sites participating in the field trial were able to retrieve Telidon pages from the Bell Vista computer. They had access to (1) a modified version of the TVO database, and (2) other information such as shopping, business information, games, etc.

Formative evaluation

The Office of Project Research (OPR) of TVOntario was requested to conduct an evaluation to begin the exploration of Telidon's impact and potential in education. This department worked closely but parallel with the Telidon Project Team.

OPR's research team conducted a formative evaluation of the impact and potential of this Telidon system during the last year of the three-year field trial, which officially ended in June 1982. The last year, coinciding with the 1981-82 academic year, saw an expansion of TVO's Telidon activity. The delivery of new equipment, the addition of a second database (Bell Vista), and the availability of a cheaper data transmission system (Datapac) all resulted in an increase in the number of sites participating and in the activity at many sites.

The main goal of this evaluation was to provide systematic and coherent feedback from participants that could be applied to the continuing development of Telidon in education, and to explore potential uses rather than merely assess present abilities that may be transitory. This information fell into five categories:

<u>Utilization</u>. How was Telidon being integrated into the educational and learning environment of each institutional type? Was it complementing, replacing, or modifying existing learning systems? Who were the main users in each group? Who are the potential users in each group?

<u>Patterns of use</u>. Which elements of the database were being accessed? By whom? For what purpose? How were the sequences chosen by users?

<u>Sequence assessment</u>. What contributed toward a sequence's appeal and learning effectiveness? What detracted? What were the roles of graphics and colors in the sequences?

<u>Learning impact</u>. What was the effect of Telidon on learning in specific populations?

<u>Perception of those involved</u>. How did users perceive Telidon? How did mediators such as teachers, librarians, and university faculty perceive Telidon?

This report seeks to describe the strengths and weaknesses of Telidon at a given point in its development and as perceived by a wide variety of users.

It should be noted that logistics and timing did not allow for an opportunity to collect information on teletext — the broadcast version using Telidon. Therefore this report deals only with the videotex mode used during the field trial.

METHODOLOGY

The following methods were used to gather information during the course of the evaluation.

1. Structured telephone interviews with major users and administrators at each site to monitor use of terminals

2. Visits of selected sites, and formal and informal interviews with participants at the sites

3. Informal observation of participants using the Telidon terminals

4. Interviews with page creators on their experiences of producing pages at TVO

5. Structured interviews with elementary- and secondary-school teachers on their reactions to specific Telidon sequences; with these interviews supported by a questionnaire that dealt with teachers' reactions to certain sequences and their criteria for choosing sequences

6. Two in-depth examinations of Telidon use at the secondary-school level:

   - a controlled experimental evaluation of a secondary-school sequence

   - a case study of Telidon as a component in teacher-independent distance education

7. Questionnaire- and interview-based examinations of student reaction to Telidon sequences:

   - two student evaluations of secondary-level curriculum-related sequences

   - a questionnaire that obtained student reactions to three postsecondary-level sequences

8. A questionnaire administered at the end of the field trial to participants who had been site providers and page producers

All research instruments used during the evaluation are collected in a separate publication.

TELIDON ACTIVITY AT THE PARTICIPATING EDUCATIONAL INSTITUTIONS

The research effort included 34 institutions across Ontario, out of a total of 45 active sites (as of March 1982). The table below shows how many educational institutions were included in the evaluation, and the number that produced at least one sequence for the database.

Table 1. Number of Institutions Studied and Number That Produced Sequences

Type of Institution	Number of Sites Studied	Number of Sites Producing at Least One Sequence
Elementary school	5	3
Junior high school	2	2
High school *	10	8
College (CAAT)	4	3
University	5	5
Library	3	2
Special institutions **	5	4

*Including a distance education pilot project.

**Including: one medical institute, one museum, two schools for the hearing-impaired, and one group home for the disabled.

Schools

Of the 17 elementary, junior high, and high schools, slightly more than half were extensive users of Telidon. They undertook any or all of the following: (1) used the system in a curriculum-oriented application, (2) held a large number of demonstrations for teachers and students, (3) provided extensive free use for students and teachers. Only two or three of the schools could be said to have accomplished all three of these.

Colleges

Of the four colleges of applied arts and technology, three produced sequences for the TVOntario database. One of the colleges produced and used a curriculum-based sequence, though it undertook very little exploratory work and few demonstrations. The other colleges used Telidon less formally, involving students and faculty in a more exploratory fashion, with the intention of teaching about Telidon. One of the colleges used its sequence as an introduction to the college library.

Universities

All five of the universities in the study produced sequences. Two of the universities based their Telidon activity at their faculties of library science, two at faculties of computer science, and one in the university library.

Libraries

Two of the three libraries produced sequences for the database. Demonstrations were given to the public at all three libraries and free use was encouraged as often as technical problems permitted.

Special institutions

While the five special institutions did not fit into the foregoing categories, their patterns of use are somewhat similar to those of the other institutions.

The medical institute operated very much like the most active college; it produced a sequence directly related to its course of studies and used it with students, and evaluated it on its own.

The two schools for the deaf used their terminals in much the same way as the elementary and junior high schools. At one school, which created a sequence, students were given free access to the terminal and one teacher made efforts to apply the system to the problems of teaching the hearing-impaired. The other school, which did not create a sequence, restricted access to the terminal, and did not apply Telidon to teaching.

The museum site operated somewhat like a library. A sequence was produced but it was not intended for a defined student body. The terminal was available for public use.

The group home for the disabled was a more unusual site. A sequence on information for the disabled was produced. The terminal was used by the residents recreationally, but there was no formal educational use.

SUMMARY AND DISCUSSION OF FINDINGS

A tremendous amount of information about Telidon in education was accumulated during the final year of field trial, so this summary is necessarily somewhat selective. Also, since the field trial was changing and improving up to and including its final days, these findings are not intended to be conclusive, but rather indicative of Telidon applications to education.

1. Use of Telidon terminals at participating institutions

1.1 Patterns of use at all sites

- Most Telidon use consisted of learning about Telidon, rather than learning with Telidon.

- The most frequent use of the Telidon terminal was for demonstrations of the system.

- The second most frequent use was for casual exploration of the system.

- Terminals were often used for demonstrations of the site's sequence(s).

- Some users, often younger ones, would play game sequences, at times accessing game sequences from other databases.

- Goal-oriented use of the terminal included information searches and curriculum-based applications, and research and development.

1.2 Use of Telidon at elementary and secondary schools

At both elementary and secondary schools:

- Demonstrations of the "new technology" were given to classes at all levels.

- At some sites demonstrations were given to users from across the school board.

- There was some curriculum-based use, usually by teachers using a sequence they had created or which had been produced by a teacher at their school.

- Some teachers searched for Telidon sequences relevant to their teaching needs. Teachers reported being unable to find appropriate sequences.

- Searches were hampered by incomplete indexes. At some sites teachers would alert each other to available sequences, often by printing a printed list of useful sequences.

At elementary schools:

- Elementary-school teachers usually mediated between Telidon and the students by operating the key pad and reading to the students from the screen.

- There was little independent student use.

At secondary schools:

- Overall, secondary schools accounted for the greatest use of Telidon. More secondary schools participated in the trial than other types of institutions; more sequences were created by secondary-school teachers than by participants from other institutions.

- At the secondary-school level there was extensive casual exploration of the system by an interested subpopulation of students. They often sought out game sequences from other databases.

1.3 Use of Telidon at colleges of applied arts and technology

- Demonstrations to students and staff of the technology and of sequences created by college participants were common.

- There was some casual use by students when the terminal was made available.

- Users at college libraries undertook few searches for informational sequences. The small number of available databases (two) limited this use.

- There was limited curriculum-oriented use. However, one college used its sequence instead of lectures in an introductory course.

1.4 Use of Telidon at universities

- Computer science departments at two universities conducted extensive research and development in Telidon technology.

- University libraries undertook limited (and often unsuccessful) searches for informational sequences.

- One university library attempted a cooperative project with a local public library.

- Difficulties in updating local information led one university to develop a local host computer database and page production.

- Two university libraries produced sequences that served as introductions to library services.

1.5 Use of Telidon at public libraries

- Demonstrations were given to library patrons.

- Some attempts were made to access informational sequences. These efforts dwindled when information was not found in the first few attempts. Technical problems and a lack of useful information were considered causes of this decrease in use.

1.6 Use of Telidon at special institutions

- Patterns of use paralleled those at schools and colleges, with the added emphasis on their own special needs.

2. Some factors affecting Telidon use

2.1 Demonstrations and workshops

- Demonstrations conducted during the field trial succeeded in interesting many potential users in Telidon.

- There was a demand at some sites, particularly at elementary and secondary schools, for further in-depth demonstrations or workshops dealing with technical operation of the system, troubleshooting, and methods of applying Telidon to educational problems.

2.2 Telidon contact people

- Individuals who took responsibility for the terminal and served as the liaison with TVOntario's Telidon project team affected the patterns of use at their sites.

- These contact people's administrative position and level of enthusiasm for Telidon helped or hindered their promotion of Telidon in their institution.

- Administrative barriers at the participating institutions acted inadvertently to exclude possible Telidon users who were not closely affiliated with the contact people at the sites.

2.3 Time constraints

- A major constraint on the acceptance of Telidon was the lack of time teachers, instructors, and librarians could devote to it. Telidon contact people and other highly motivated participants often learned to use Telidon on their own and without remuneration.

- Teachers complained of difficulties in fitting Telidon use into their already crowded teaching schedules.

2.4 Placement of terminal in institution

- Placement of the terminal could affect its use critically. Terminals located in one classroom often received little exploratory use and limited use by teachers other than the contact person.

- Ideal location for the terminal was in an institution's library or resource centre, with ability to move into a private room.

2.5 TVOntario database indexes

- The Table of Contents index, listing sequences alphabetically by title, was the most commonly used by field trial participants. Other indexes, such as those listing sequences by grade or subject, were rarely available for system users.

- Users were limited by the available indexes. Teachers requested indexes by grade and subject. Some participants requested that indexes identify sequences according to type or format of presentation (such as "game," "information," "planned lesson").[1]

- Users expressed a need for cross-referenced indexes to reduce the time required to search for information or sequences.

- There was some demand for printed cross-reference indexes as support materials.

- Many teachers requested a catalogue of sequences. They wanted information on intended audiences, educational objectives, and suggestions for use of each sequence. The Telidon project team produced and distributed such a catalogue when this need became known.

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1. The reported need for such identifying terms corroborates the findings presented in the DOC's report Telidon Behavioural Research 2: The Design of Videotex Tree Indexes (Ottawa, 1981). Its study indicated that descriptors decreased errors and increased user preferences of indexes. DOC also found evidence supporting the efficacy of testing indexes on a sample of users. See chapter 4, pp.65-104.

2.6 Printed documentation [1]

- Many users, especially teachers, wanted a short, clear set of instructions on how to log on and access pages.

- A simply worded but complete user's manual was also needed to describe how to use Telidon and how to troubleshoot when technical problems arise.

- Some users expressed an interest in having a technical manual explaining Telidon's organization and operation.

- Few of the sites used the Telidon and Education booklet distributed by the TVO Telidon team in the first years of the field trial. At some sites the contact person(s) produced their own short instruction sheet.

- Several teachers emphasized the need for multiple copies of any printed material at each Telidon site.

3. Technical aspects of Telidon in Education

3.1 Branching-tree structure [2]

- Some users who were not familiar with computers did not easily understand the hierarchical branching structure used in the field trial. The Norpak Telidon User Guide (1982), a one-sheet instruction manual with a diagram of the tree structure, was distributed when it was available, near the end of the field trial. Several teachers felt that it helped explain how Telidon worked.

- A user accessed a sequence by entering a "page number" on a small key pad. These long strings of numbers (from three to six digits) could be tedious to use and caused some errors in use.

- Because of the difficulty in using indexes to find the page numbers of sequences (see above 2.5), many institutions bypassed the menu search and produced printed lists of useful sequences and their page numbers.

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1. The demand for printed support materials may seem a step backward for those intimately involved with computer communications. However, this demand for print should not be seen as a misunderstanding or rejection of the technology. These needs were voiced by educators interested in Telidon and its promotion; printed materials are suggested as a way of stimulating interest and reducing demands on the user.

2. In the field trial a branching-tree structure was used (see appendix.) However, Telidon is compatible with other page storage and retrieval systems.

- The use of printed lists of selected sequences at some sites bears out the findings of many librarians and other participants familiar with computers: they found the tree structure cumbersome and inefficient in handling large amounts of information. They felt that too many pages had to be screened to find the page of interest.

- Difficulties arose when, within a sequence, users wanted to see a page of interest that did not immediately precede the page being viewed. In such cases, the user had to have noted the page number of interest previously, begin the sequence again, or search for it hit and miss; these alternatives were time consuming and often impractical, as when a teacher was using a sequence in class with students.

- Telidon CAI sequences were considered to be limited, compared with CAI courses on other computer systems. The branching structure requires the user to enter the page number of each page desired. Therefore, Telidon CAI sequences were all organized in a multiple-choice format; for instance, the user is asked a question and provided with several possible answers, with page numbers corresponding to each. Some participants felt that a complete CAI system must allow the users to generate their own responses.

3.2 Telidon key pad [1]

- Use of the key pad was a relatively minor issue in most users' adaptation to Telidon. However, observation of new users indicated that for many of them, especially adults:

> The correspondence between a key and its number or symbol was often ambiguous. Users suggested that the number be placed on the keys themselves.

> Some users found the numbers in the wrong order: the size and shape of the key pad led users to expect a matrix like that of the common calculator.

> The "go" or "send" key wasn't clearly enough marked, given its frequent use.

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1. Most of the field trial terminals were supplied with Norpak Mark 3 key pads.

3.3 The Telidon terminal screen [1]

- The natural pattern of use seems to involve groups of approximately six or less. This pattern permitted easy viewing by all users and a sense of sociability in the process.

- Classroom use was often hampered by the size of classes and the illumination in the room. Viewers at the back of a room were often unable to see the sequence clearly from a distance. Window blinds often had to be drawn and lights dimmed for users to see the screen clearly.

3.4 Speed of the system

- The waiting period between pages, though generally acceptable, could be slow and frustrating when the number of terminals accessing the host computer was large.

- Complex graphics were often so long in appearing that their impact was undermined. This was especially true if a graphic was repeated more than once in a sequence, or if the sequence was accessed again after initial use.

- Since transmission rates were not constant, pages on which images were built up over a period of time were often ineffective. The time it took for the graphic to appear was different from the time the page producer had intended. Sometimes the pages would be overly long in display, sometimes too short to permit the intended impact.

3.5 Accessing the host computer

- Participants were very encouraging about their ability to access databases on distant computers.

- Users reported difficulty in accessing or "getting on" the host computer. Usually the source of the problem was the limited number of ports, or points of access to the computer. Next most often, poor transmission over phone lines disrupted access.

- Inexperienced users found the logging-on procedure complicated because of unclear instructions and the number of digits required.

- Teachers, including those experienced in Telidon use, found logging on somewhat disruptive of their lessons.

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1. Most terminals in the field trial used a modified Electrohome color TV set as a screen.

3.6 Telephone access of computers

- Though phone transmission was perceived as expensive by some participants, TVO's subsidization of transmission costs makes it difficult to assess exactly how phone costs would affect the use of Telidon in education.

- Some participants suggested that local storage of Telidon sequences would help overcome the cost and unreliability of phone line transmission.

- Those sites that had experience with Datapac phone lines were pleased with its dependability; it was also recognized as a cheaper alternative to regular phone lines.

3.7 Breakdowns

- The system's general technical unreliability was the one most crippling factor in the field trial. Frequent breakdowns were reported and they tended to produce a negative attitude among users, especially among first-time and hesitant users.

- Participants understood that these breakdowns were part of a field trial of a new technology, but many expressed the view that these difficulties would be unacceptable if they continued.

3.8 Other technical configurations

- The field trial's technical configuration - a small number of databases on a central host computer accessed by distant terminals - was considered effective. However, users also considered other configurations as potentially effective. These other configurations were: accessing sequences from local computers or from in-house storage devices.

- Some users, especially library and university sites, wanted to be able to access more than one or two databases with their terminals.

- Some users expressed an interest in being able to store sequences locally. Several teachers suggested downloading CAI sequences; others considered local storage on disc or tape desirable.

- Some sites that were involved in exploring micros in education were interested in seeing microcomputers with Telidon capacities.

- Many users suggested that a full keyboard was essential for educational use - the numeric keyboard was simply too limited.

4. Telidon databases and their contents

- Library and university sites seemed to use Telidon as an information source. High schools employed the CAI possibilities of Telidon, while elementary schools tended to use all types of sequences to assist teachers' in-class presentation.

- Many users, especially teachers, expressed a need for information on how to use sequences.

4.1 Size of the field trial databases

- Participants, while enthusiastic about the technology, expressed a need for a greater range of software – educational sequence, information, etc.[1]

- It is difficult to assess the amount of information or sequences required. However, it should be noted that the field trial participants were a diverse group: their needs could not be served by incremental increases in the database. Librarians demanded access to as many sources of information as possible. Teachers required educational sequences for students at many educational levels in dozens of different subjects. To provide adequate service to these potential Telidon users would require a tremendous growth of the database (or of the number of available databases).

- Many participants felt the available databases were too small to provide enough useful sequences and information.

The TVO educational database was not extensive enough to supply sequences in the many subjects and educational levels required.

The other databases (DOC and Vista) were often found to be too small and with out-of-date information.

4.2 TVOntario educational database

- In elementary and secondary schools the TVO database was criticized for not containing sequences relevant to existing curricula.

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1. Participants in the field trial could access one of two databases: (1) the TVOntario educational database with approximately 60 sequences, and (2) the DOC database with a variety of information and game sequences. Later in the field trial, participants were able to access a second host computer containing a modified version of the TVO database and the Vista database supplying general information and advertiser-supplied information, games, etc.

4.3 Telidon in computer-assisted instruction

- Telidon was used to provide computer-assisted instruction to students, primarily at the highschool level. Most often, CAI sequences were used by the teachers who had produced them.

- One limiting factor in the use of Telidon CAI sequences was teachers' difficulty in integrating Telidon into their teaching style. Teachers were unaware of what materials were covered in the available sequences, and at what level. Also, in schools where the terminal was not in operation until well into the term it was sometimes difficult to arrange to use Telidon for computer-assisted instruction because teachers had already planned their teaching strategies.

- Teachers familiar with other CAI software found Telidon limited compared with CAI courses on other computer systems. They found the interaction between student and software was restricted because multiple-choice questions/answers were used instead of student-generated answers. Also, there was no record of student interaction.

4.4 Information uses of Telidon

- Field trial participants searched for information in the TVO database and the DOC and Vista databases.

- The TVO database had few sequences that were strictly informational.

- Many of the sequences on the database that had a game format provided information. However, users found that sequences with a game structure prohibited selective searching for information within the sequence. For instance, game sequences like Globe-tour or Tag the the Flag provided information on countries of the world, but their structure made it extremely difficult to find information on a specific country of interest.

- Since sequences were not identified in the TVO Table of Contents index according to their type – e.g., educational game, or information – users could not know where to find information or educational games. (See section 2.5 above for information on indexes.)

4.5 Graphic uses of Telidon

- Telidon was used successfully at the highschool and elementary-school levels to provide graphics for in-class use – as an "electronic blackboard" of sorts.

- This graphic use was incorporated into various in-class applications of Telidon: games, drill exercises, teachers' notes and diagrams.

- Some difficulties were encountered in viewing the screen in a brightly lighted classroom.

4.6 Game sequences

- Games were most often used in demonstrations of the technology and free use by students. (The games on the TVO and other database were not directly connected to any curriculum.)

- Most of the game sequences provided the user with a question first, and the informational or educational elements followed – when the users answered. Often only the correct answer initiated the presentation of the informational/educational content. This order of presentation allowed users to play the game without absorbing its informational/educational content.

- Despite great interest in game sequences, field trial participants rated games as a low priority compared with information or instructional sequences. (This may reflect an attitude among teachers that games are generally not educational, or it may reflect the small number of curriculum-based game sequences that existed on the database.)

4.7 Role of graphics

- Telidon's graphics were highly appealing and attractive.

- Users warned that graphics in sequences should provide information relevant to the sequence's topic and not serve purely as embellishment, though it was recognized that attractive graphics did serve to promote interest in the screen.

- Graphics that were very complex took very long to appear on the screen and users found this frustrating at times. Several suggestions were offered:

  Use complex graphics early in a sequence but do not repeat them. Repetition grows tedious.

  Have text appear on the screen before graphics so that the user is occupied while the graphic is constructed.

- Many page producers and other Telidon users acknowledged the difficulty of designing graphics and text that function effectively together.

4.8 Language level of sequences

- Teachers at elementary and highschool levels said they wanted Telidon sequences to be designed with a language level appropriate for intended users.

- Interviews with teachers and a survey of students indicated that sequences' level of difficulty can vary from page to page or section

  to section. Sequences should be uniform in the degree of complexity they present.

4.9 Errors in content

- Errors were found in some sequences. Both content and language errors were considered unacceptable by some librarians and teachers, especially in curriculum-based sequences.

- Some participants, including some page producers, requested more editorial review of sequences included on the database.

- Page producers had difficulty making corrections to sequences already on the database. (See below, 5.)

5. Producing pages and sequences

- The majority of sequences on the TVO database were produced by individuals from the institutions participating in the field trial.

- The travel and time of the page producers were supplied free of charge. This represents hidden costs in the implementation of Telidon, costs borne unequally by the participating institutions.

- The process of page production was considered to be time consuming.

- Though generally rewarding, page production was sometimes frustrating because of: (1) the difficulties in booking the IPS page production units, which were in great demand, (2) the technical difficulties the IPS units presented on occasion, and (3) the time it took to have a sequence included on the database (i.e., sending the sequence to the host computer and having it loaded there).

- Page producers expressed some desire for more formal training in page production.

- Page producers felt that the IPS manuals were not effective. There was also some interest in assistance in educational design of sequences.

- Page producers who completed more than one sequence gained considerably in experience, and were often critical of their first sequences.

- Interviewees suggested two solutions to alleviate some of the difficulty encountered in page creation: (1) pretesting sequences before including them on the databases, and (2) the production of sequences by teams of teachers and sequence designers.

6. Appeal of Telidon

- Users of all ages found Telidon highly appealing. Younger students seemed particularly attracted, showing little hesitation in using the system. [1]

- A subpopulation of all ages used Telidon not for its explicit content, but to explore its structure. These users "played" with the system and the games available in its databases.

- As the field trial progressed, it became clear that there was a body of committed Telidon users: some attempted broad-ranging explorations, others concentrated on using the sequence(s) they had produced. There were also many individuals at each site who showed some interest in Telidon – e.g., they attended a demonstration – but tended not to become involved with Telidon any further.

7. Future role of Telidon in education

- There was diversity of opinion regarding the future of Telidon, reflecting the range of institutional backgrounds and demands of the participants.

- Generally, the configuration used in the trial was considered suitable for providing access to large amounts of worthwhile information and materials.

- Two basic tendencies revealed in the field trial seemed to indicate directions for Telidon development: elementary and secondary schools and some community colleges tended to use Telidon for teacher support and computer-assisted instruction, while libraries, including college libraries, and universities attempted to use the system for information searches and research and development.

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1. A cautionary note should be added. It is difficult to assess the appeal of a new technology such as Telidon. The novelty of using such equipment may exaggerate the interest it generates. The finding of generalized appeal observed in the field trial should be considered with caution, as something that may change with time.

Formative evaluation and Telidon in Education

Telidon, as a technology and in its applications to education, continues to change and mature. In this light, the research conducted during the field trial is not a definitive evaluation but a source of information that can be of use in future applications of the technology. In short, this is formative research, intended to assist in the next stages of the development of Telidon and Telidon in education.

APPENDIX

The Telidon page storage and retrieval system used in the field trial[1]

Telidon allows discrete "pages" of graphic and textual information to be stored in a computer and viewed on television screens. The Telidon system used in the TVOntario field trial was designed to allow many users at different locations to retrieve Telidon pages simultaneously from one central computer. To deliver this service, Telidon's designers chose a computer system called a tree structure or branching system.[2]

In the TVOntario field trial, when users established contact between their terminals and the central computer, they were presented with an "index" displaying a series of choices. For instance:

```
Telidon Main Index

1 Education

2 News

3 Weather
```
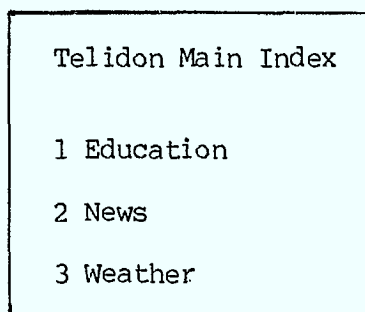
1. This appendix was written with the assistance of David Sutherland, TVOntario Telidon Project Team.

2. More accurately, "tree structure" refers to the hierarchical structure of the database, and "branching structure" is the means of navigating through the "tree." For simplicity, the two terms will be used synonymously.

This main index is at the base of the tree structure. All pages in the computer can be found along the "branches" of this tree, like leaves spreading out below an upside-down tree. (See diagram, next page.) By choosing one alternative, for example, "1 Education," the user moves along one branch of the tree. The user is then presented with another choice:

```
Education Index 1.0

1 Elementary School

2 High School

3 College/University
```
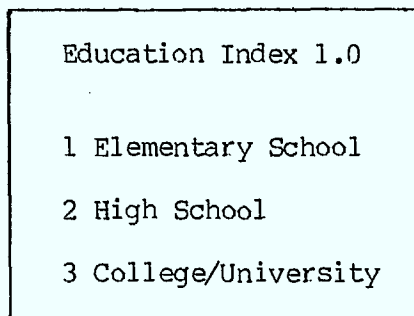
Again, the user chooses the category of interest, enters the corresponding number, and advances along the branch selected. (In our example the user chooses "2 High School.") At this juncture the user is presented with another index ("12.0" in the diagram) and must make a decision, and so on, until the page of interest is found.

The user need not use the succession of indexes to find a page. Each page has a page number - an address of sorts - by which it is identified in the computer. (For instance, "12111.0" on the diagram.) If a user already knows the number of a page he/she is interested in, then by entering the number the user moves directly to that page, bypassing the indexes.

At the bottom of the tree, pages are stored in "sequences" - series of Telidon pages organized around a theme or topic. Participants in the TVOntario field trial contributed sequences to the educational "branch" of the tree. This branch was called the TVOntario Database. However, all the terminals in the field trial could be used to access any branch of the tree
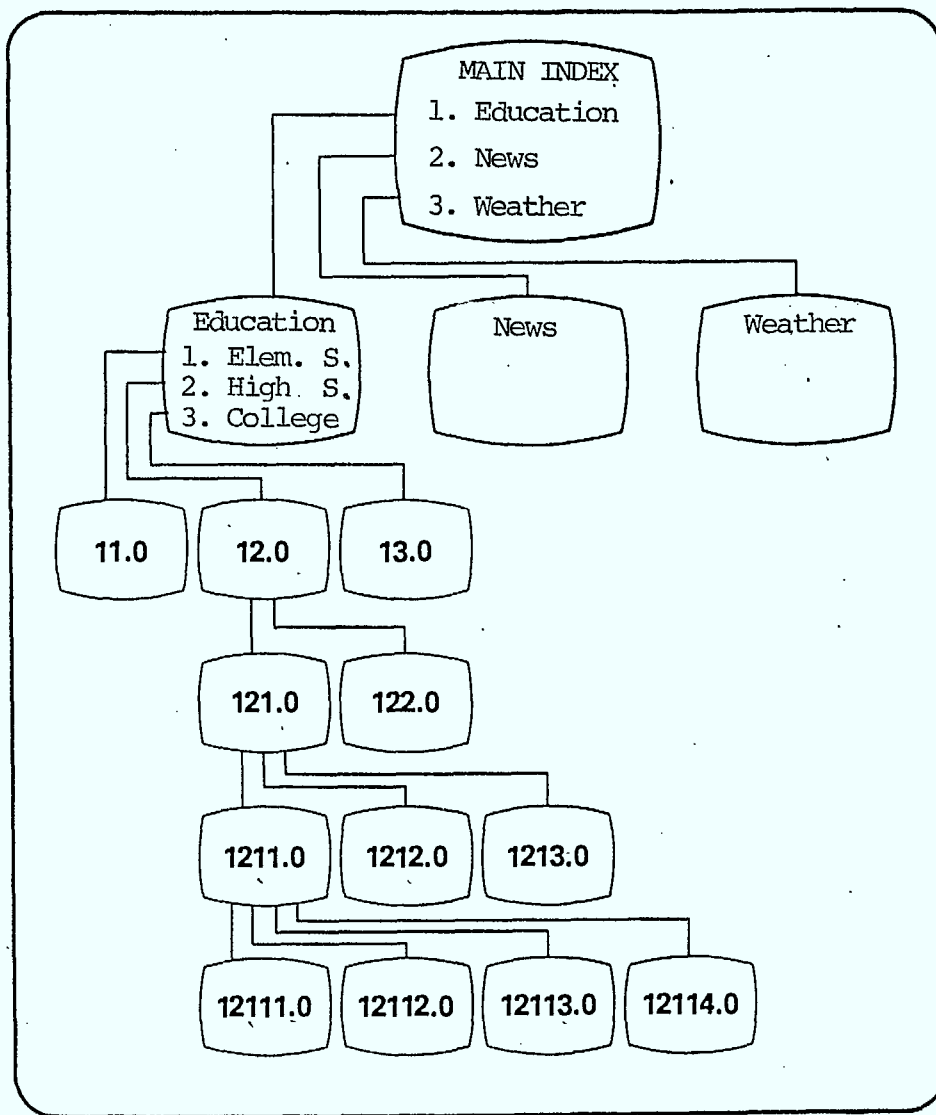
This diagram is adapted from the Norpak Telidon User Guide, 1982.

- those explicitly produced for educational uses or those designed for a general population of users, such as "News and Weather."

The tree system is only one of a number of possible systems available on modern computers and it differs from other systems in a number of important ways. For instance, in the Telidon branching system the user must actively search for and find the pages he or she wants. In other systems, such as those used by libraries in compiling bibliographies, the user search is replaced by the computer search. In the latter, the topics of interest are entered into the computer - for instance, "high school" and "biology." The computer then examines its own contents and provides the user with a list of pages or sequences that fit under both these categories, along with their page numbers.

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