ON-LINE SURVEYS OF USER AND EMPLOYEE SATISFACTION

1. Abstract

On-line survey facilities have been developed at the T J Watson Research Center (IBM, Yorktown Heights, N.Y.) Their purposes are to evaluate user satisfaction with computer services and employee satisfaction with the job. These facilities are:

  Surveys at logoff/disconn time about system response time

  On-line opinions surveys of user and employee satisfaction

A general description of the facilities, implementation, advantages, human factors, security considerations, and achieved objectives are outlined in this paper.

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2. SURVEY CONDUCTED AT LOGOFF/DISCONN TIME

2.1 Introduction

The LOGOFFs and DISCONNs commands are intercepted during the last part of the working day and the users are asked to rate the system response time. Their responses are transmitted in the form of messages to a receiving virtual machine. The receiving virtual machine captures these messages into a CMS file, and after completion of the daily survey it computes statistics and generates reports using the collected data.

2.2 Objectives

To obtain from the users an evaluation of prime shift system response time for their terminal session. To determine level of service which satisfy users and which users need help. To generate statistical reports and maintain a history of it.

2.3 Design Considerations

The interception of the LOGOFFs and DISCONNs is done by placing CMS execs with these names and their valid truncations in the system. This has the disadvantage that the LOGOFFs and DISCONNs exercised by the user at the CP level are not intercepted. However this route was chosen since it was less practical to modify the pertinent system modules. It also offers the users the choice of bypassing entirely the survey by simply typing: 'CP LOGOFF' or 'CP DISCONN'. This is desirable specially since the survey is conducted daily.

Naive users

The survey is carried out in a conversational way and without resorting to full screen displays. This avoids situations where users not familiar with full screen mode may not know how to proceed. It also eliminates the problem of having to take into separate consideration typewriter type terminals or certain other terminals (like Textronix graphic) that are treated as 2741 typewriter terminals by the system.

Burden on the users

To avoid burdening the users the LOGOFFs, DISCONNs interception takes place at random only in one out of four cases, on business days from 3:30PM to 6:00PM and is limited to one per user per day.

Syntax equivalent to CP LOGOFF and CP DISCONN

Any permissible syntax for the CP logoff and disconn commands can be exercised when the logoff/disconn execs are invoked. In addition they are operational in any environment where the CP commands are valid (Editors, Dial PVM etc.)

Speed of execution

The design results in a a prompt logoff and disconn when the survey is not taken place (Before 3:30PM and after 6:00PM). This is particularly important because any noticeable increase of waiting time when logging off or disconnecting would be a frustration unacceptable to the user.

Security

A user is disconnected or logged off if he does not answer within a certain time the question raised by the execs when interception and surveying is taking place. This is done for security reasons to take into account the case of somebody logging off (or disconnecting) and walking immediately away from the terminal.

Users running disconnected

For obvious reasons the survey is bypassed for the case of users running disconnected.

2.4 General description

There are two main components to the facility, namely: a collection of CMS system execs and a receiving virtual machine.
The first component intercepts the LOGOFFs and DISCONNs commands, asks the user to enter a rating of system response time and then proceeds to complete the command's intended action.
The second component captures the responses of the users and produces statistical reports.

2.4.1 CMS execs that intercept the LOGOFFs and DISCONNs

These execs logoff and disconnect a user after asking the following question: "How do you rate today's system response for processing your prime shift work?. Type 1 for very good, 2 for good, 3 for fair, 4 for poor, 5 for very poor, or 0 for no opinion." They do not survey the user if one of the following conditions occur:

1) The day of the week is not a business day

2) The time of the day is not in the interval (15:30 to 18:00)

3) The user is running disconnected

4) The user does not have a R/W minidisk accessed as A

5) The user has already participated in the survey during that day

The following additional precaution is taken:

6) The user is logged off or disconnected if he fails to response within 60 seconds

2.4.2 Receiving virtual machine

The following are the main functions of this receiving station:

a) To capture any messages send to it by the users during the time the survey is conducted

b) To compute statistics on the users responses at the conclusion of the survey

c) Maintain on line only information for the last 20 business days

Daily, on business days, the receiving virtual machine wakes up at 15:25 and places itself into a receive state during the survey's time (15:25 to 18:00). It then captures the incoming users responses and places them in a CMS file. At 18:00 it leaves the receiving state and generates or modifies the following files:

RESPONSE FILE, contains statistics (including the average rating of response time) for: the last business day, accumulative month to date, for the last 20 business days. This file is shown in figure 1 of Section 2.6

COMPLAIN FILE, contains a history of the users ratings for the last 20 business days sorted in descending order from the lowest to the highest rating and subsequently by frequency.

RESPONSE HISTORY, contains a record of the RESPONSE FILE for the last 20 business days.

RESPONSE LOG, contains a record of the users ratings for the last 20 business days. Extraneous messages, no opinion ratings, and duplicate entries deleted. A duplicate entry is a record with the same userid, the same rating for the same date.

After generating these files the virtual machine places itself into a sleep state until 15:25 of the next business day.

2.5 Graphics obtained by using the collected data

The average daily user rating of response time was plotted versus some of the recorded system measurements. Figures 2 and 3, in Section 2.6, show the plots of the average response time rating versus the daily average response time and the daily average expansion factor respectively, for the VM V system at Yorktown, and for the interval November 18, 1981 to February 2, 1982.

Figures 4, 5 and 6, in Section 2.6, show the daily user rating of response time of the 3 VM systems at Yorktown, on a monthly average basis, from June 82 to June 83 together with the hourly response time, hourly expansion factor and downs per day.

2.6. Figures for generated report and graphs

FIGURE 1

```
DATE: 83/07/20
RESPONSES (INCLUDING NO OPINION): 82          NO OPINION: 17   21%
                    VERY                              VERY   NUMB    AVG
SERVICE             GOOD      GOOD     FAIR    POOR   POOR   RESP   RATING
------------      --------  --------  --------  --------  --------  ----  ------
RESP. T.            17%  11  28%  18   35%  23   9%   6   11%   7    65    2.69
RESP. T. P>50       0%   0   0%   0    0%   0    0%   0  100%   1     1    5.00


DATE: 83/07/01 TO 83/07/20
RESPONSES (INCLUDING NO OPINION): 917         NO OPINION: 226   25%
                    VERY                              VERY   NUMB    AVG
SERVICE             GOOD      GOOD     FAIR    POOR   POOR   RESP   RATING
------------      --------  --------  --------  --------  --------  ----  ------
RESP. T.            13%  88  28% 193   31% 214  13%  93   15% 103   691    2.90
RESP. T. P>50       8%   2  15%   4    46%  12   8%   2   23%   6    26    3.23


DATE: 83/06/22 TO 83/07/20
RESPONSES (INCLUDING NO OPINION): 1392        NO OPINION: 347   25%
                    VERY                              VERY   NUMB    AVG
SERVICE             GOOD      GOOD     FAIR    POOR   POOR   RESP   RATING
------------      --------  --------  --------  --------  --------  ----  ------
RESP. T.            12% 130  28% 297   29% 305  13% 139   17% 174  1045    2.93
RESP. T. P>50       10%  3  17%   5    47%  14   7%   2   20%   6    30    3.10
```

Figure 2

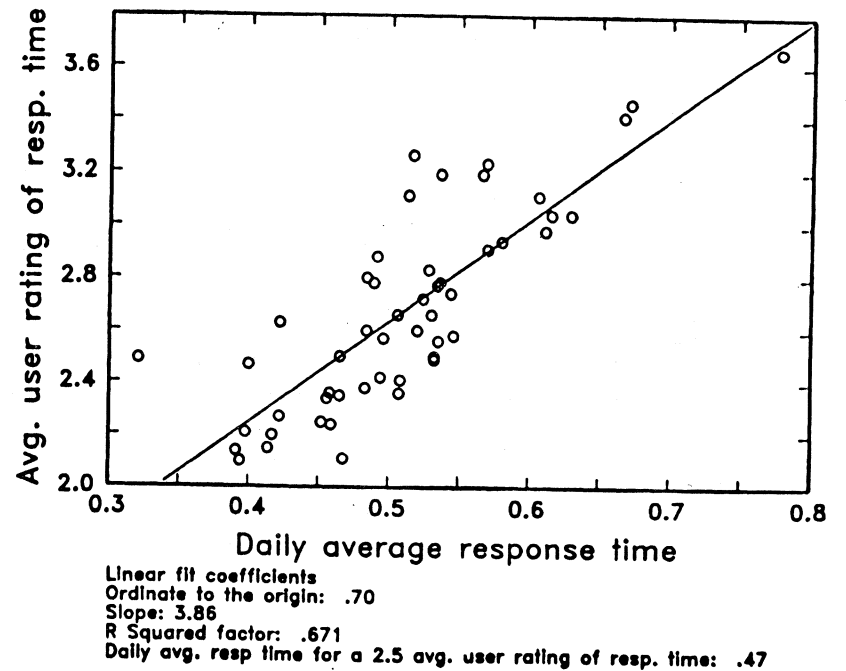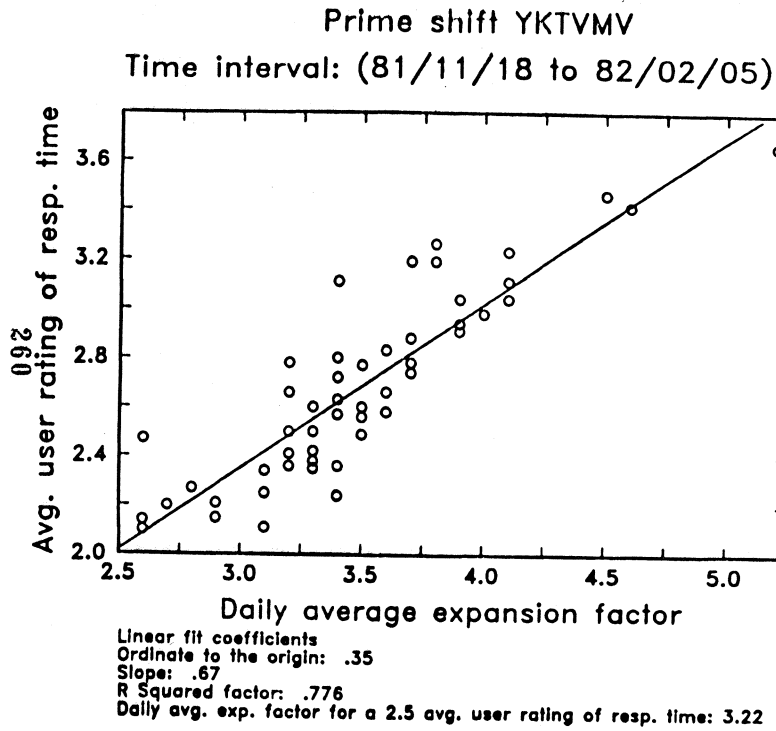Prime shift YKTVMV

Time interval: (81/11/18 to 82/02/05)

Linear fit coefficients
Ordinate to the origin: .70
Slope: 3.86
R Squared factor: .671
Daily avg. resp time for a 2.5 avg. user rating of resp. time: .47

Figure 3

Prime shift YKTVMV
Time interval: (81/11/18 to 82/02/05)

Linear fit coefficients
Ordinate to the origin: .35
Slope: .67
R Squared factor: .776
Daily avg. exp. factor for a 2.5 avg. user rating of resp. time: 3.22

SERVICE OBJECTIVES – prime shift

HOURLY RESPONSE TIME (seconds), 90th percentile
and
USER'S RATING of response time

V: YORKTOWN VM V
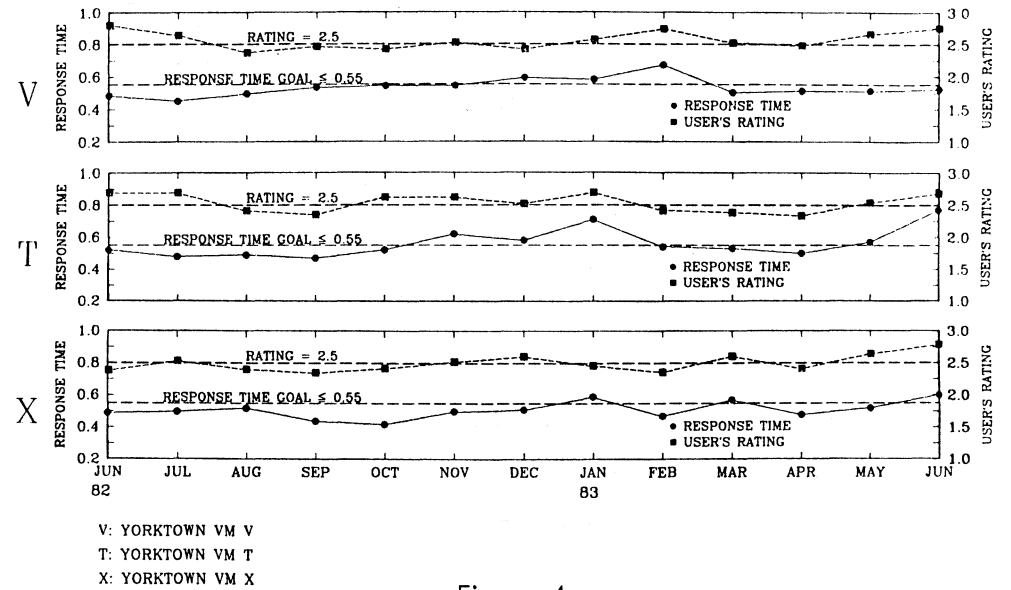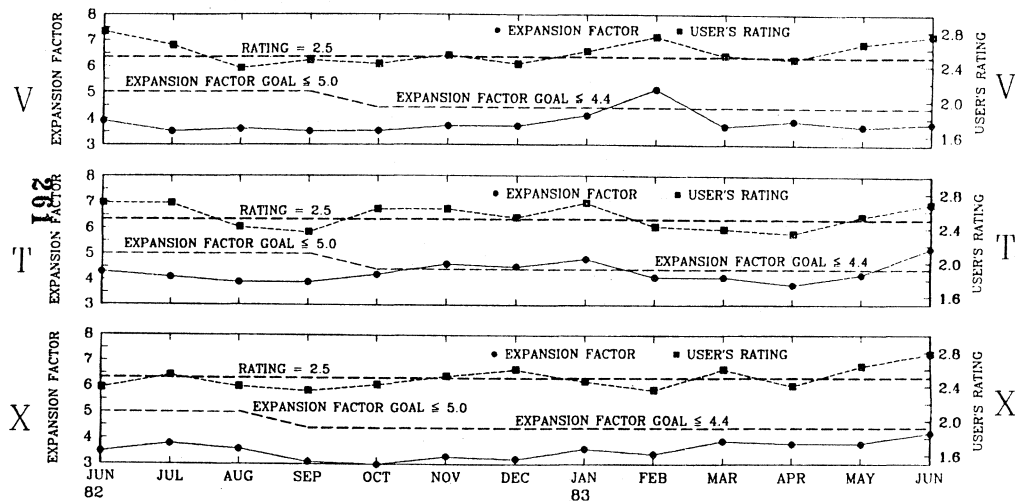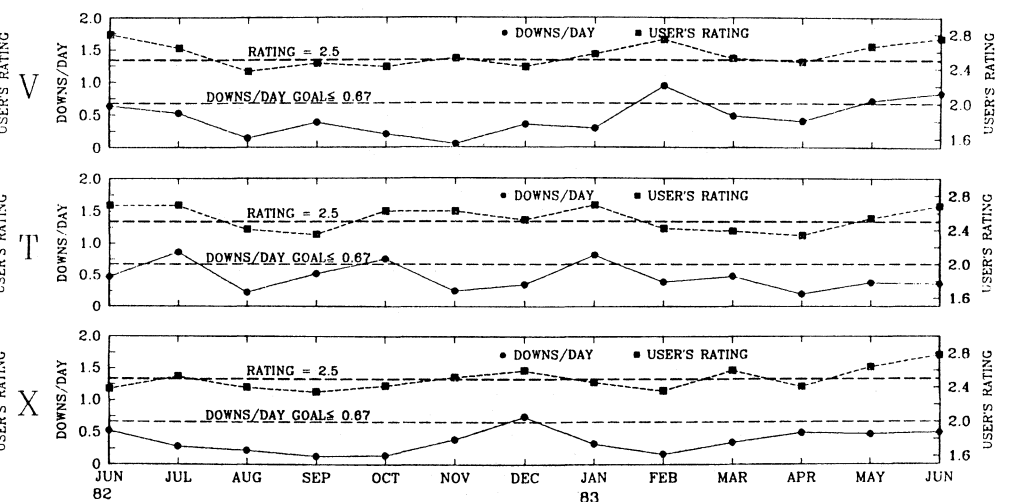T: YORKTOWN VM T
X: YORKTOWN VM X

Figure 4

SERVICE OBJECTIVES – prime shift

HOURLY EXPANSION FACTOR, 90th percentile
and
USER'S RATING of response time

V: YORKTOWN VM V
T: YORKTOWN VM T
X: YORKTOWN VM X

Figure 5

SERVICE OBJECTIVES – prime shift

DOWNS/DAY
and
USER'S RATING of response time

V: YORKTOWN VM V
T: YORKTOWN VM T
X: YORKTOWN VM X

Figure 6

3. ON-LINE OPINION SURVEYS OF USER AND EMPLOYEE SATISFACTION

This facility has been used to conduct the Annual Survey of Yorktown Computer Services and the IBM Research Division Opinion Survey.

3.1 Introduction

In response to a system command SURVEY the user is presented, in full screen mode, with the pertinent survey questions and offered the opportunity to enter related comments. At the end of the session the user's replies are transmitted to a collecting virtual machine for tabulation and report generation.

3.2 Objectives

The main objectives of on-line surveys are the capability of conducting surveys on a very short notice, without all the hassle of related paperwork and mailing, and the ability to generate automatic summary reports of answers either on a partial progressive or final basis. These objectives have been achieved only partially since in most cases not all the survey participants have access to a computer terminal, are familiar with the pertinent techniques, or are willing to take a survey on line preferring instead the conventional way of filling a paper form. Reduction in the use of paper, greater flexibility for the user to file his survey, improved security, elimination of ballot stuffing and greater appeal to certain users are some of the additional advantages of on-line surveys.

3.3 General description

The facilities covered in this paper operate under VM/SP and are functional in tube type terminals only. The different components were written in CMS EXEC2 language. Full screen support is provided by IOS3270 (The Display Input/ Facility). There are three main components to the facility, namely:
A system command, named SURVEY, to be invoked by the user in order to take the survey.
A receiving station or collector where the surveys are transmitted to and collected.
Postprocessing programs for tabulation.

3.4 Flexibility to the user and human factors

The questions of the survey may be answered by the user in any order. An index permits the selection of any desired question. Any or all the answers may be reviewed at any time and/or before transmission. The survey may be ended by the user at any time with the option of continuing later. This enables him to take the survey in several sessions if he so desires or finds it necessary. However this feature is not available in surveys about very sensitive or confidential matters for security reasons. Comments may be entered by means of the participant's preferred CMS editor.
After the invocation of the command the user is presented with an introduction that contains instructions to the survey. The survey itself consists of the displays of a certain number of frames containing the survey questions and instructions to the user on how to proceed. Defined PF keys permit him to slide from display to display. There is little room for operational errors since input fields are the only ones that are unprotected, furthermore the autoskip feature of full screen mode is in effect throughout the survey.

3.5 System command SURVEY

SURVEY is the CMS system command that initiates the survey. It is operational only during the duration of the survey. The users' replies and comments are written in a CMS file in one of his minidisks. At the end of the survey the users' answers are transmitted to a receiving virtual machine for collection. The conduction of a new survey requires the change of the input data file containing the questions and IOS3270 full screen control characters.
In the case of confidential surveys and for security reasons the following are additional restrictions:
  The availability of the command SURVEY is restricted to business hours.
  During the users' session his answers are kept in temporary disk space.
  The advantages are that the information is not accessible, and it is erased in case of a system crash. The obvious disadvantage is that the information is lost if the system crashes with the result of the user having wasted his effort.

3.6 The collector

The survey files are read as soon as they arrive to the collector virtual reader. The originating user id is detected at this time and recorded with the aim of precluding ballot stuffing. In the case of confidential surveys and for security reasons the following additional features are implemented:

The user id undergoes checks for eligibility (i.e if it is a regular IBM employee) and for previous participation. Despite these checks the participant remains anonymous.
Rejected files are discarded and the originator is notified electronically of the reasons for the rejection.
Accepted survey files are assigned a sequential number and encrypted provided the virtual machine is operating in enciphering mode. Encryption is done by means of IPS/CMS Cryptographic Program (IBM IUP 5796-PPK). The originator is notified by electronic mail about his survey's acceptance. An enciphering key is used for encryption of the files. Enciphering mode is established at the time the enciphering key is entered manually by the survey administrator. The enciphering key resides in virtual memory only for security reasons. The key is tested to determine if it is the right key. Wrong keys are rejected. The right key is the key entered by the survey administrator at key establishment. Key establishment is done only once by means of a key generation program. No record of the key remains in disk storage. The collector notifies the survey administrator when is not operating in enciphering mode (i.e. every time the system is brought up). Multiple checks exclude the possibility of a survey file being lost. In this regard the collector notifies the survey administrator and the programmer about the nature of any malfunction and then logs itself off. Access to the receiving virtual machine is restricted to the survey administrator and authorized employees.

3.7 The postprocessing programs

This component completes the cycle of automating the conduction of surveys.
There are currently two postprocessing programs. One for confidential surveys (i.e. an IBM Opinion SURVEY), and another for surveys where confidentiality is not so critical. In either case the programs require information about the structure and format of the survey. The final output consists of summary reports containing statistical tabulations of the survey's answers, plus files where the users' comments are classified and appended. Postprocessing may be done on several sessions as the survey progresses or at its conclusion. In the case of the IBM Research Division Opinion Survey the postprocessing component is an interface to TOSS (Total Opinion Survey System) developed by IBM Corporate.
The following steps and considerations apply to the case of confidential surveys:
The survey files are deciphered. The cipher key is entered manually by the survey administrator and it resides in virtual memory only. Generated reports are encrypted and all deciphered files are erased before the session is ended. Access to the postprocessing programs is restricted to the survey administrator and authorized employees.

3.8 Usage

The survey facility has been used at the Thomas J. Watson Research Center of IBM since 1981 to conduct the Annual Survey of Yorktown Computing Services. It was also used to conduct the IBM Research Division Opinion Survey, Fall 1982. These surveys were also available in paper form.
1100 employees participated in the IBM Research Division Opinion Survey. Of this 517 took the survey on line (47% of the total).
356 users took the 1982 Annual Survey of Yorktown Computing Systems. Approximately half of them (177) participated on line.

3.9 Demonstration

The following example demonstrates through captured spooled console images the case when a user invokes the SURVEY command, replies to questions 1 and 2, selects from the index question 9, answers question 9, enters comments to question 9, answers question 10, ends the survey and transmits his answers.

The survey introduction is displayed following the invocation of the system command SURVEY. In this case the introduction extends over several frames. Only the first frame is displayed.

The first question is displayed after the introduction. The cursor is positioned at the first input field.

ANNUAL SURVEY OF YORKTOWN COMPUTING SERVICES

In order to determine user satisfaction with our services, we are conducting this survey.

Please base your answers only upon your experiences during the past three months.
Do not answer questions which do not apply to you or for which you have no opinion.

This survey consists of 39 questions. You can proceed to the following question by pressing the ENTER key or go back to the preceding question by pressing PF7. You are not limited to this sequential mode but may move to any question you wish by pressing PF2 and making a question number selection from a question index.   You may go back to enter your response to a previous question that was left unanswered, or to change a previous response.

Whenever a question applies to more than one service, the

_____

Press 'ENTER or PF8' to CONTINUE (Next frame);
PF3 (Quit);

QUESTION 1 OF 39

Which one of these computers have you used the most during the past three months?

(Enter an x in appropriate field.)

==> _   VM-V

==>   VM-T

==>   VM-X

==>   MVS/TSO

==>   IBM PC

==>   IBM PC connected to VM

_____

PF2 (For question index);   Press 'ENTER'or PF8 to CONTINUE;
PF3 (End);   PF4 (To enter comments);   PF7 (To view Introduction);

After a reply has been entered in the first field the
cursor moves to the next input field (autoskip feature).

Question 2 is displayed next following the replies to question 1.

QUESTION 1 OF 39

Which one of these computers have you used the most during
the past three months?

(Enter an x in appropriate field.)

==> x VM-V

==> _ VM-T

==>   VM-X

==>   MVS/TSO

==>   IBM PC

==>   IBM PC connected to VM

      PF2 (For question index);   Press 'ENTER'or PF8 to CONTINUE;
    PF3 (End);   PF4 (To enter comments);   PF7 (To view Introduction);

QUESTION 2 OF 39

Where are you located?

(Enter an x in appropriate field.)

==>   x Yorktown

==>   _ Eastview

==>   Another IBM location (specify):

      PF2 (For question index);   Press 'ENTER' or PF8 to CONTINUE;
    PF3 (End);   PF4 (To enter comments);   PF7 (Previous question);

The survey index is displayed after pressing the PF4 key.
The index extends over several frames. Only the first frame
is displayed. Question 9 is then selected.

SURVEY INDEX

1. Which one of these computers have you used the most during the past
    three months?
2. Where are you located?
3. For what purposes do you use Yorktown's VM and/or MVS computing
    systems?
4. For what purposes do you use the IBM PC?
5. To what extent has your PC usage affected your usage of Yorktown's
    VM and MVS computing systems?
6. How do you rate average system response for most of the work that you do
    on prime shift?
7. How do you rate average system response for your prime shift interactive
    work that requires moderate to large amounts of computer resources (e.g.,
    system responses exceeding several seconds)?
8. How do you rate turnaround time for your prime shift batch work?
9. How do you rate turnaround time for your printouts?
10. How do you rate system reliability (number of times the system goes
    down during your working session)?
11. How do you rate system availability (fraction of time
    system is available when you need to work)?

ENTER QUESTION NUMBER ===> 9   AND PRESS ENTER

PF3 (Quit Index);   PF7 (Previous frame);   PF8 (Next frame);

Next the user enters his replies to question 9 and then decides
to enter some comments. To do this he presses the PF4 key.

QUESTION 9 OF 39

How do you rate turnaround time for your printouts?

(Enter: 1 for very good, 2 for good, 3 for fair, 4 for poor, 5 for very poor.
Leave blank for no opinion.)

==>   2 Versatec/Benson (DRAFT) printers
==>   2 APS-5 photocomposer
==>   1 3800
==>   1 Self-service printers at Yorktown
==>   2 6670 printers at Yorktown
==>   3 Confidential output at Yorktown
==>   At Eastview
==>   At other IBM locations over network
==>   IBM PC

PF2 (For question index);   Press 'ENTER' or PF8 to CONTINUE;
PF3 (End);   PF4 (To enter comments);   PF7 (Previous question);

The intention to enter comments was signaled at question 9 by
pressing the PF4 key. the user enters now his comments, and
files. He is then returned to the survey questionnaire.

After answering question 10 the user decides to end the
survey by pressing the PF3 key.

```
 C$9$      MEMO      A1  F 80  TRUNC=80 SIZE=3 LINE=3 COL=1 ALT=2
XEDIT:
```

How do you rate system reliability (number of times the system goes
down during your working session)?

(Enter: 1 for very good, 2 for good, 3 for fair, 4 for poor, 5 for very poor.
    Leave blank for no opinion.)

```
00000 * * * TOP OF FILE * * *
00001 COMMENTS TO 9:  How do you rate turnaround time for your printouts?
00002
00003 Printouts are sometimes misplaced by the operator
      |...+....1....+....2....+....3....+....4....+....5....+....6....+....7...
00004 * * * END OF FILE * * *
```

```
==>  2 VM-V
==>  2 VM-T
==>  2 VM-X
==>  1 MVS/TSO
==>  2 Network - among Yorktown systems
==>  2 Network - between Yorktown and other IBM locations
==>  3 MSS
==>  1 IBM PC
```

PF2 (For question index); Press 'ENTER' or PF8 to CONTINUE;
PF3 (End);   PF4 (To enter comments);   PF7 (Previous question);

```
===> file
```
                                            XEDIT/ykt 1 FILE

The user is presented with a multiple choice menu.
He then chooses option 1.

Your replies to this survey are stored only on your disk.
What would you like to do with them?

1. **Transmit them (for tabulation with other users' replies)**
   and erase them from my disk.

2. **Do not transmit them, but keep these replies on my disk**
   so that I may continue the survey at some other time.

3. **Do not transmit my replies and erase them from my disk.**

4. **Do not transmit my replies. Let me resume taking the**
   survey at the point where I left.

5. **Do not transmit my replies. Let me review the survey**
   starting at question 1.

_____

ENTER SELECTION NUMBER ===> 1   AND PRESS ENTER

3.91 Format of the survey replies in the Collector.

The following data, transmitted to the receiving virtual machine for tabu-
lation, corresponds to the example in the demonstration in section 3.9.
The data has undergone some preliminary processing and is ready for
postprocessing.


```
YKTVMT TOLABA TUESDAY 07/26/83 13:19:48 13:22:33
ANSWERS TO QUESTION 1
X
ANSWERS TO QUESTION 2
X
COMMENTS TO QUESTION 3
COMMENTS TO 3:  For what purposes do you use Yorktown's VM and/or MVS
                computing systems?
ANSWERS TO QUESTION 9
2 2 1 1 2 3
COMMENTS TO QUESTION 9
COMMENTS TO 9:  How do you rate turnaround time for your printouts?

Printouts are sometimes misplaced by the operator
ANSWERS TO QUESTION 10
2 2 2 1 2 2 3 1
```