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Evaluation of the Off-Line Electronic Benefits Transfer Demonstration

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Potential Impacts of Hybrid EBT Systems on the Food Stamp Program

A Special Topics Report on Hybrid Systems

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Each of these experts contributed valuable knowledge of the existing services offered and used for EBT and commercial application, as well as their view of the future of POS and ATMs in the United States.

Our panel of experts included:

Henry Dreifus, Dreifus Associates, Ltd.
Scott Goodwin, Advanced Promotional Technology
William Haeuser, Eltrax Systems, Inc.
George Harrison, Advanced Promotional Technology
Lawrence Ladouceur, MasterCard Technology Development
Lawrence Linden, Linden & Associates
Gilles Lisimaque, Gemplus Card International
Jean McKenna, VISA International
Thomas McLaughlin, Deluxe Data Systems, Inc.
Kevin Meyer, MasterCard Technology Development
Benjamin Miller, Independent Consultant
C. Sidney Price, National Processing Company
James Russell, CoreStates Financial Corporation
John Taskett, Micro Card Technologies, Inc.
John Woczik, Verifone

Additional data was obtained through The Food Marketing Institute, The National Association of Convenience Stores, Ohio's Food Grocers Association, Payment Systems News, Bank Network News, and Money Station.

FCS Contract Number: 53-3198-013

FCS Project officer: Margaret Andrews

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[1] Formerly the Food and Nutrition Service.

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Chapter 1

PROJECT OVERVIEW

Throughout the past decade, the Food and Consumer Service (FCS)[1] of the U.S. Department of Agriculture has demonstrated the delivery of Food Stamp Program (FSP) benefits electronically, using both on-line and off-line technology. Evaluations of these demonstrations[2] have determined that both technologies are viable methods for delivering FSP benefits to recipients, although both provide different advantages and disadvantages. FCS initiated this special topic report to explore the technical and practical considerations of implementing and operating EBT systems for single or multiple programs which combine both on-line and off-line technologies.

RESEARCH QUESTIONS

The study addressed the following research questions posed by FCS:

- Given the existing technology in 1993, what are the feasible program alternatives for combining on-line and off-line technologies?
- What are the practical considerations in implementing and operating hybrid EBT systems?
- What information is available to project the potential cost of hybrid systems?

These questions and the issues surrounding them are presented below.[3]

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[1] Formerly the Food and Nutrition Service (FNS).

[2] Gary L. Glickman, et al., *The Impacts of the Off-line EBT Demonstration on the Food Stamp Program*, Phoenix Planning & Evaluation, Ltd., Rockville, MD, April, 1994; and, John A. Kirlin, et al., *The Impacts of the State-Initiated EBT Demonstrations on the Food Stamp Program*, Abt Associates Inc., Cambridge, MA, April, 1993.

[3] Data collection regarding each of these questions was conducted during the Summer of 1993. The information presented herein was not updated to reflect changes that may have occurred since then.

What are Feasible Program Alternatives for Combining On-line and Off-line Technologies?

This question explores the technical and functional feasibility of hybrid EBT systems. Four hybrid scenarios were developed from conversations with FCS and discussions with experts in the fields of electronic transaction processing, card and security technology, and POS terminal development. The scenarios include:

- on-line or off-line EBT systems based upon geographic area;
- one benefit program on-line and one benefit program off-line operating within the same geographic area;
- one benefit program accessed via both on-line and off-line technology; and
- off-line security and on-line transaction processing.

The first two scenarios focused discussions on the ramifications of sharing the card access vehicle and support system access technologies. The last two scenarios researched the feasibility of utilizing both on-line and off-line technologies to deliver a single set of benefits.

What are the Practical Considerations in Implementing a Hybrid EBT System?

This question explores the practical side of implementing a hybrid system and centers on five primary issues:

- *The availability of terminals capable of supporting a hybrid system.* Within this document we examine existing POS and ATM devices, their current capabilities, and the potential to retrofit or enhance these terminals to process both on-line and off-line transactions.[1] In addition, we gathered expert opinion on the likely future of smart card technology in the United States to determine if anticipated developments will support, conflict with, or have no impact on EBT.

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[1] Retrofitting of ATM and POS terminals to process both on-line and off-line transactions may require the following: reprogramming to include additional processing software and hardware modifications (re-engineering) to accommodate the attachment of other equipment (e.g., the creation of an additional input/output (I/O) port for attaching a smart card reader).

- *The availability of transaction processors which support on-line and off-line processing.* In the existing EBT sites, a single processor provides either on-line or off-line services. A hybrid system supporting both on-line and off-line technologies may be operated by two processors or a single processor, depending upon the design of the system. Issues surrounding the number of processors needed to support various hybrid scenarios are identified.[1]

- *The impact of hybrid EBT systems on third party processors.* The ability of third party processors to support hybrid EBT systems was examined. Alternative methods for transaction processing to accommodate any limitations of third party processors were also explored.

- *The outlook for deployment of smart card based financial processing systems.* The widespread acceptance of smart cards will require a change in the existing infrastructure, which was developed to support magnetic stripe, on-line processing. This document explores some of the issues driving the development of smart card applications.

- *The cost considerations of implementing and operating a hybrid EBT system.* A discussion of the cost advantages and disadvantages of each of the hybrid scenarios is provided. This cost information is based on data gathered from the off-line and on-line EBT demonstration projects [2] and provided by the industry experts.

What Information is Available to Project The Cost of Hybrid Systems?

This question focuses on the economics of a hybrid EBT system and is discussed generally in terms of design, development, implementation, and operations of each of the four scenarios.

The evaluations of on-line and off-line EBT systems have examined the costs of providing food stamp benefits at specific EBT sites. These evaluations provide benchmarks for the overall cost of designing, developing, implementing, and operating on-line and off-

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[1] These include: the ability to provide processing for both on-line and off-line systems; the prospect of joint ventures between processors; and the administrative issues surrounding issuance file transfers and modifications to numerous processors, properly directing the benefit authorization information, settlement and other technical and procedural issues.

[2] Glickman, op. cit.

line EBT systems. The findings of these evaluations, supplemented with information derived from some of the experts interviewed, were used to address hybrid costs.

PROJECT METHODOLOGY

The project was conducted in two phases. The first phase centered on the development of the four hybrid scenarios, while the second phase focused on determining the potential impacts of each scenario. The methodology used for each of the project phases is discussed below.

Phase One -- Development of the Hybrid Scenarios

The hybrid scenarios were developed from discussions with FCS, transaction processors, and card and terminal manufacturers. These discussions considered a variety of ways in which on-line and off-line technologies may be combined to maximize the strengths and advantages offered by both technologies, while minimizing the weaknesses or disadvantages. In addition, consideration was given to hybrid scenarios which may arise if both on-line and off-line EBT systems co-existed (i.e., on-line EBT for the delivery of some benefit programs and off-line EBT for the delivery of other benefit programs or on-line EBT in one area and off-line EBT in a neighboring area).

Four hybrid scenarios emerged from these discussions. A limited number of industry experts were then asked to review the scenarios for technical and functional viability. From interviews with these experts, detailed descriptions of the processing options, capabilities, and other considerations were developed for each scenario.

Phase Two -- Potential Impacts of Hybrid EBT Systems

The second phase of the project involved researching the technical and functional implications of each of the hybrid scenarios. The information for this research was obtained through the following:

- in-depth interviews with industry experts including card and terminal manufacturers, third party processors, industry consultants, and bank card membership organizations (VISA and MasterCard); and

- comprehensive review of data provided by retail associations and networks, and obtained from the evaluation reports prepared for the off-line and on-line EBT demonstration projects.

A list of individuals with expertise in plastic card applications was developed with the assistance of FCS.[1] These experts were selected for their experience with transaction processing, card and security technologies, POS terminal development, and innovative card applications. In this phase, industry experts were called upon to: review hybrid scenarios, assess the direction of the point-of-sale (POS) and automated teller machine (ATM) infrastructure within the United States, and identify the future applications for magnetic stripe and smart cards. In-person and telephone interviews were conducted with each of the industry experts. Interview guides were provided in advance of the interviews to provide background into the project's research objectives and each of the four hybrid scenarios.

In addition to reviewing the hybrid scenarios, industry experts also provided information on technical developments, market trends in transaction processing and card usage, and the impacts hybrid scenarios might have on the existing or anticipated commercial environments (e.g., commercial transaction processing). Estimates on the extent of POS deployment in the United States were provided by network operators, terminal manufacturers, and retail associations. Terminal manufacturers also addressed the possibility and requirements to retrofit existing terminals in order to accommodate hybrid scenarios. Equipment and operating costs were provided by the industry experts whenever possible.

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[1] The list of industry experts is included in the Acknowledgments of this report.

ORGANIZATION OF THE REPORT

Chapter 2 provides a brief background on EBT systems and a discussion of on-line and off-line system processing. In addition, each of the hybrid EBT scenarios is described. Chapter 3 explores the practical considerations of hybrid EBT systems while Chapter 4 examines the technical feasibility of hybrid systems. Chapter 4 includes a detailed description of each of the hybrid scenario along with a discussion of the processing options and issues surrounding the scenarios. Chapter 5 addresses the economics of hybrid scenarios in terms of system design, development, implementation and operations.

Chapter 2

BACKGROUND

The Food and Consumer Service (FCS) has taken a lead in the exploration of EBT as part of a continuing effort to improve the efficiency and integrity of benefit programs. In 1983, FCS launched an EBT system in Reading, Pennsylvania, to deliver Food Stamp Program (FSP) benefits. This effort marked the first of several demonstration projects to test the functional capabilities of EBT. Today, eight EBT systems are in operation throughout the nation and more are in various stages of system development. In addition to the efforts of FCS, other federal and state agencies are actively participating in the development of EBT systems.

EBT is an electronic funds transfer technology which combines automated financial transaction processing with point-of-sale (POS) terminals and card access devices to deliver federal and state benefits to recipients. Recipients use a plastic card to access food stamp and cash benefits at POS terminals and cash benefits at automated teller machines (ATMs). EBT does not impact the recipient certification processes, but provides an electronic alternative to paper-based benefit delivery methods including paper food coupons and checks.

EBT TECHNOLOGIES

Two technological approaches to EBT have been demonstrated to distribute food stamp benefits: on-line using a magnetic stripe card and off-line using an integrated circuit (IC) chip embedded on a card (smart card). Most of the food stamp EBT demonstrations use on-line technology. Only two demonstrations have been conducted to examine off-line EBT systems: the Dayton, Ohio, off-line EBT demonstration, which issues food stamp benefits, and the Wyoming off-line EBT project, which issued Special Supplemental Food Program for Women, Infants, and Children (WIC) benefits. Two additional off-line demonstration projects are scheduled: one in Wyoming which will distribute WIC and FSP benefits to a larger participant area and retailer base than the previous demonstration, and

the other in Ohio which will be a state-wide demonstration project separate from the current demonstration project in Dayton. This second project is scheduled to begin by March 1995.

Early demonstrations focused on the feasibility of EBT. Results from the evaluation of the off-line EBT demonstration in Dayton and the on-line EBT demonstration projects[1] have proven that both approaches are an effective and reliable means of delivering benefits. Recipients prefer EBT to food coupons and paper checks because it is more convenient and less costly to use. Retailers who accept food stamps find that EBT relieves them of the burden of having to store, count, and deposit food coupons. Financial institutions, which process checks and food coupons, also prefer EBT over the paper-based alternatives because it reduces handling costs and automates deposits to retail accounts.

On-line and Off-line EBT

Both on-line and off-line EBT systems are functionally similar from the recipient point of view, though many aspects of the actual processing are different. An on-line EBT system requires a real-time communications link with a central database or EBT host computer. Verification of the recipient's personal account number (PAN) and personal identification number (PIN), authorization of transaction requests, and maintenance of the transaction history are all conducted at the EBT host computer. The plastic card in an on-line EBT system functions primarily as an access device to route the transaction request to the EBT host computer by maintaining the recipient's PAN and necessary routing information. On-line systems typically use a magnetic stripe card but are not necessarily synonymous with this technology. A variety of card technologies may accommodate on-line transaction processing, including smart cards and optical memory cards.

An off-line EBT system does not require a real-time telecommunications link with the EBT host computer, although a telecommunications link is necessary to update the EBT host computer and conduct retailer settlement. The plastic card in an off-line system

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[1] On-line evaluation projects for Pennsylvania, Minnesota, and New Mexico.

maintains the recipient's benefit account and security information. Verification of the recipient's access and authorization of transaction requests are conducted between the card and the POS terminal. To accommodate this functionality, the card must have memory and processing capability. Currently the off-line EBT demonstration projects have all used smart cards, although optical memory cards and non-standard magnetic stripe cards may support off-line transaction processing as well (e.g., transit fare system). A brief discussion of on-line and off-line processing is provided below.

On-Line EBT

An on-line EBT system operates similar to a commercial debit or credit card system. To access benefits, the recipient inserts the benefit card into an ATM or POS terminal and enters his or her PIN. The amount of the benefit draw is entered into the terminal and an electronic message is sent through a telecommunications link to the EBT host computer. The host verifies the recipient's PIN, authorizes the transaction against the recipient's available balance, and sends an authorization or denial message back to the ATM or POS terminal. All authorized transactions are immediately posted to the recipient's account and reflected in the available balance.

Manual transactions are necessary when the telecommunications network, POS terminal, or EBT host computer is malfunctioning. If the EBT host computer is operating, the manual transaction may be authorized over the telephone against the real-time account balance maintained at the EBT host computer. If the manual transaction is the result of the EBT host computer malfunctioning, no account information will be available to authorize the transaction request.

Benefit issuances and adjustments are posted directly to the EBT host computer with no additional card interaction. Hot card files, used to block access to a benefit account, are also updated without delay at the EBT host, providing immediate protection to the benefit balance when a card is reported lost or stolen.

Off-line EBT

In an off-line EBT system, the recipient's access information and benefit account data is maintained on the card. Transaction processing is similar to that of an on-line system, except that no interaction with the EBT host computer is necessary at the time of each transaction. To process a transaction, the recipient inserts the benefit card into the POS device and enters his or her PIN. The PIN validation is performed immediately between the card and the POS device. The system then checks the in-store database to determine if the card is listed on the hot card file or if there are any staged transactions to be posted to the card.[1] Information found on the in-store database is loaded to the card and the amount of the benefit draw is then entered into the terminal for authorization against the available balance on the card. At the end of each business day, the retailer initiates settlement through a telecommunications link with the EBT host. A batch transfer of the day's transactions is sent to update the EBT host computer. At this time, the host may also send issuance or hot card files to update the store's terminals.

Manual transactions are necessary when a benefit card or POS terminal is malfunctioning. Manual transactions may be authorized over the telephone against the account balance maintained at the EBT host computer. However, the host balance may not reflect the most recent account balance, since it includes only those transactions which have been transmitted to the EBT host computer for settlement. In addition, manual transactions may be immediately posted to the EBT host computer, but the recipient's benefit balance on the card -- against which all non-manual transactions are authorized -- will not be updated until after the next download of account adjustments during settlement. Therefore, overdrafts of benefit accounts can occur since the balance on the card is used to authorize any subsequent, non-manual transactions. Due to the liability associated with authorizing transactions against an uncertain benefit balance, the Dayton off-line EBT system requires that retailers accept full liability for any manual transactions processed.

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[1] Staged transactions may include new benefit issuances and manual transactions.

In the Dayton demonstration, the posting of benefit issuances is a three step process. First, the EBT host receives the issuance data from the state, similar to the issuance process for an on-line system; second, the host computer transmits the issuance data to a selected number of retailers or issuance locations; third, the issuance data is posted to the benefit card when it is presented at one of the issuance locations. Unlike benefit issuances, benefit adjustments, manual transactions, and hot card files may be transmitted to *all* retailers for updates to cards during normal transaction processing.

HYBRID EBT SYSTEMS

This section provides a brief overview of each of the four hybrid scenarios developed and examined within this study.

Scenario Number 1: On-line or Off-line EBT Based Upon Geographic Area

Scenario number 1 examines the use of both on-line and off-line EBT systems in different locations within a state. For example, an off-line EBT system may be implemented in an urban area, where transaction volumes are expected to be high, to reduce telecommunications costs, while an on-line EBT system may be implemented in a rural area where transaction volumes are expected to be low. This scenario explores the impact of co-existing systems and the capability of transaction processing *across* technologies.

Scenario Number 2: One Benefit Program On-line and One Benefit Program Off-line Within The Same Geographical Area

This scenario examines the implications of operating an on-line EBT system for one benefit program (or group of programs) and an off-line EBT system for another benefit program (or group of programs). For example, non-cash benefit programs might be administered off-line while cash benefit programs would be on-line, or vice versa.

Scenario Number 3: **One Benefit Program Accessed Via Both On-line and Off-line Technology**

Scenario number 3 explores the feasibility of one benefit program or benefit account, accessed by *both* on-line and off-line technologies. In this scenario, the benefit card has a magnetic stripe and an IC chip. The recipient may access their benefits using either off-line or on-line transaction processing depending on the terminal capability at the retail location.

Scenario Number 4: **Off-line Security and On-line Transaction Processing**

This scenario explores using a smart card in an on-line transaction processing environment. The benefit card is a smart card with memory capacity. The card maintains the transaction routing information along with the recipient identification and security information. The recipient's benefit account is maintained at a central database. Transactions are authorized and posted against the central database through a telecommunications link at the time of each transaction.

Chapter 3

WHAT ARE THE PRACTICAL CONSIDERATIONS IN IMPLEMENTING A HYBRID SYSTEM?

The practical considerations for implementing hybrid electronic benefits transfer (EBT) systems are addressed in this chapter. They are:

- the availability of terminals capable of supporting a hybrid system;
- the availability of transaction processors which support on-line and off-line processing;
- the impact of hybrid EBT systems on third party processors;
- the outlook for deployment of smart card based financial processing systems; and
- the cost implications of implementing and operating hybrid EBT systems.

In addition to these considerations, several administrative and practical considerations are addressed in the review of the hybrid scenarios in Chapter 4.

AVAILABILITY OF TERMINALS CAPABLE OF SUPPORTING HYBRID SYSTEMS

ATM and POS terminals are available with dual processing capabilities to read both magnetic stripe and smart cards. This dual processing capability has been deployed throughout France and other European countries for several years. However, within the United States, the deployment of dual processing terminals is just now beginning to occur. To date, most terminals deployed in the U.S. that support smart cards do not also support magnetic stripe cards and are used almost exclusively in what is called a "closed" system, e.g., a pre-paid card on a university campus (and many of these applications actually use the magnetic stripe on the cards instead of the chip). One industry expert indicated that one bank in the United States has begun installing ATMs with smart card capability. Likewise, most major manufacturers of POS terminals and ATMs reported that they are currently developing and/or manufacturing POS terminals with dual capability.

Point of Sale (POS) Terminals

A large number of devices with varying capabilities can be classified as POS terminals. The most common is a small keypad device usually located next to the cash register and used for credit and debit card sales. These low cost devices contain two key components: a magnetic stripe reader and a modem. The reader extracts information from the stripe on the card, usually the bank routing number and the account number and sends this information to a database via the modem. The terminal has limited memory and processing capability.

There are three main applications that utilize this type of device. The first is check authorization/credit card processing. In check authorization, the customer is typically issued a "convenience" card that contains a magnetic stripe. The data on the stripe identifies the customer. A message is sent to a central database for authorization. The central database usually maintains a negative file indicating customers from whom checks should not be accepted. In credit card processing, the merchant uses the device to obtain an authorization number from a bank processor indicating that there is a sufficient balance available in the customer's line of credit. The merchant then "runs" the card through a device which prints the account number and merchant number on the credit slip. The customer signs the slip and the merchant submits it to his or her processing institution for credit.

The next application is referred to as EDC (electronic draft capture) in which the processing institution captures all data necessary to credit the merchant and debit the card account as the transaction is processed. EDC eliminates the need to process the paper credit slip. The merchant either runs the card through a separate device to print a credit slip for the customer to sign as evidence of the sale or uses POS equipment to automatically print the draft. In either event, the merchant retains the credit slip as evidence of the sale or for back-up.

The third application is debit. Debit card processing typically requires that the customer validate and authorize the sale by entering a personal identification number (PIN)

rather than a physical signature. Processing debit card transactions therefore requires the addition of a PIN pad to acquire and encrypt the PIN data. This POS device/printer/PIN pad represents the minimum configuration for EBT. However, our research indicates that few retailers are equipped with this configuration, though many may be equipped for check authorization or credit card processing.

Extent of POS Deployment

As of mid 1993, approximately 33 percent of all major supermarkets in the United States have on-line authorization capabilities.[1] This includes POS debit/credit card processing as well as check authorization. Interest in POS terminals has continued to increase over the past several years and experts predicted that all major supermarkets will be equipped with on-line authorization capabilities within the next few years. Smaller grocers and convenience stores are showing a slower migration to POS (excluding combination gas station/convenience stores which are implementing POS for gas and other purchases). Experts suggest that on-line POS may not be cost effective for smaller grocers and convenience stores because the average transaction amount for these stores ($3 to $14) does not justify the cost of on-line authorization.[2] Fees such as discount fees (between 1 - 4 percent of the total transaction), telecommunications costs, interchange fees, switch fees, and settlement fees may exceed profit margins for low dollar transactions. It was the opinion of several experts that an average transaction amount of $20 or more was necessary to justify implementing debit or credit POS.

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[1] Through telephone conversations with VISA International and The Food Marketing Institute, both organizations indicated that there are approximately 30,000 multi-lane supermarkets in the United States, of which roughly 10,000 have electronic authorization (check, debit, or credit) capabilities.

[2] The average transaction amounts for small retailers and convenience stores was provided by industry experts through telephone interviews and confirmed with the National Association of Convenience Stores. A similar average transaction amount was experienced in the Dayton, Ohio off-line EBT demonstration.

Based on available information, POS deployment in the State of Ohio is estimated to be less than five percent.[1] Additional telephone interviews with retailers at several large supermarkets in the state confirmed the low presence of POS terminals but indicated that they were planning to implement systems within the next two years. (Approximately seventeen percent of the authorized food stamp retailers in Ohio are large supermarkets.)

Existing Terminals

POS terminals currently deployed at retail stores can be divided into four categories: Basic POS Terminal; Enhanced POS Terminal; Integrated Terminals; and, Integrated Electronic Cash Registers. The functionality and requirements to retrofit these terminals to process both magnetic stripe and smart cards are described below.

Basic Terminals. (e.g., Verifone Tranz 330 and 340) These terminals (pictured in Figure 1) read magnetic stripe cards and are used in retail stores to process credit and debit transactions. The terminals typically have limited memory (32k bytes RAM), a built-in magnetic stripe card reader, a digital display screen, and one-to-four input/output (I/O) ports available for connection with a PIN pad, printer, power source or local area network (LAN). The terminals do not usually communicate directly with a cash register. Transaction amounts are entered into the terminal by the check-out clerk and are verified by the cardholder through the key pad portion of the terminal. Transaction processing is controlled by software installed in the terminal. The amount of memory available within the terminal can affect how sophisticated the process will be. If the application requires that

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[1] Information was gathered through telephone interviews with the industry experts, listed in the acknowledgements, and the following organizations: Ohio's Food Grocers Association, The Food Marketing Institute, National Association of Convenience Stores, Payment Systems News, Bank Network News, and Money Station. In addition, Money Station, the largest transaction processor for the state, provided a list of all stores in the state with POS capabilities, including food retailers and non-food retailers. The total number of stores with POS capabilities in Ohio (370 food retailers and non-food retailers), is five percent of the total authorized food stamp retailers in the state (approximately 7,400) as provided by the Midwest Regional FNS Office.

a PIN be entered, this is usually accomplished on a PIN pad connected into one of the available I/O ports.

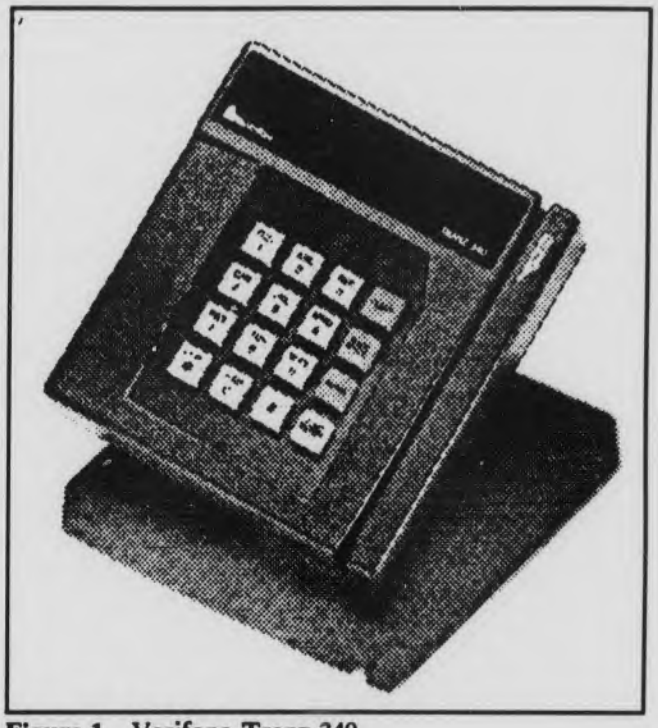

Figure 1 - Verifone Tranz 340

Basic terminals are the most prominent terminals in the United States. Experts estimated that 80 percent of all retail POS terminals fall into this category. The Tranz 340 was the initial terminal used in the Dayton off-line EBT project.[1] The Tranz 340 terminals were modified to process smart cards *only*. The modifications included the following:

- attaching a smart card reader with additional memory and built in PIN pad through the PIN pad port;
- disabling the magnetic stripe processing capability by removing the required application software (to free terminal memory so that the smart card processing software could be installed); and
- loading the terminal with smart card processing software.

This process did not create a terminal capable of supporting a hybrid system since the magnetic stripe card capability was disabled.

Experts were divided on whether it is practical to modify a basic terminal to process both magnetic stripe and smart card transactions and whether it would be cost effective or desirable to do so. Some experts indicated that some older terminals may not have sufficient ports to support the PIN pad/card reader. However, those who suggested that the terminals could be retrofitted indicated that the following modifications would be required:

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[1] The EBT processor is now implementing the OTT 2000 for single lane retailers (discussed later) as well as the DataCard 485IC for multi-lane retailers.

- an enhanced PIN pad with integrated smart card reader and sufficient terminal memory to accommodate off-line transaction processing (approximately $100 - $150, depending on the amount of memory and number of terminals purchased);[1] and

- installation of smart card processing software into the enhanced PIN pad. As previously stated, the memory in the basic terminal is not currently sufficient to accommodate both the magnetic stripe and smart card software applications.

Experts agreed that modifying basic terminals was not a desirable approach to implementing hybrid EBT for three reasons. First, the cost to retrofit the terminals may not be cost effective ($100 - $150 plus the cost to develop special software and hardware modifications that may be needed) compared to the purchase price of a new terminal with built in dual processing capability. Second, additional attachments would make the terminal cumbersome and undesirable to retailers; and last, separate readers for magnetic stripe and smart cards could lead to confusion for recipients and retail clerks.

Figure 2 - Verifone Omni 490

Enhanced Terminals. (e.g., Verifone Omni 490) - Like the basic terminals, enhanced terminals (shown in Figure 2) read magnetic stripe cards and are used in retail stores to process on-line credit and debit transactions. However, these terminals are usually located on the customer side of the check-out counter, typically have 256k byte RAM of memory, with a PIN pad, programmable keys, and five ports for connection with a register, bar code

[1] Cost data were gathered through telephone interviews with industry experts and manufacturers.

reader, LAN, printer, and power source. Enhanced terminals are in increasing demand by large supermarkets because of the additional convenience they provide (e.g., interaction with the register, single-unit PIN pad and reader, and user-friendly screen instructions). The cost of these terminals range from $400 - $700.[1]

Experts believe enhanced terminals can be adapted to process both magnetic stripe and smart cards transactions. The memory capacity of the terminals is sufficient to install the processing software to support smart cards. A smart card reader[2] will need to be attached through one of the available ports because the existing card reader in the terminal is a swipe style reader which reads only magnetic stripe cards.[3] Having to use separate card readers was considered by the experts as a disadvantage to retrofitting an enhanced terminal to process magnetic stripe and smart card based transactions because it could lead to confusion for the recipient and retail clerk.

Integrated Terminals. (e.g., Oki America OTT 2000 and Innovatron TPSCAM 1000) Integrated terminals have all of the functionality of enhanced terminals and are equipped with motorized card readers capable of processing both magnetic stripe and smart cards. With 256k byte to 2 megabytes of RAM, these terminals offer fast processing for a variety of check-out functions. Integrated terminals are currently being installed in the Dayton off-line demonstration project in single-lane stores. The Innovatron TPSCAM 1000 is pictured in Figure 3.

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[1] Cost data were gathered through telephone interviews with industry experts and manufacturers during the Summer of 1993.

[2] The cost of a basic smart card readers was provided by experts and manufacturers at approximately $25, not including software development.

[3] Magnetic stripe and smart cards are read differently. The magnetic stripe requires a smooth swiping motion to pass by the reader, while the smart card requires a lock with the reader while the card is being read. Motorized readers, similar to those found in ATMs, are available to read both card types but are more expensive and have greater maintenance requirements than non-motorized card readers.

There were three primary reasons for the change in the POS platform in single-lane stores in Dayton. First, the OTT 2000 is less expensive than the configuration that was being used in single-lane stores;[1] second, the availability of the motorized card reader would reduce the number of times a card was removed prematurely from the reader; and third, the integrated terminal eliminates the need for the in-lane terminal to communicate with an in-store host reducing the total transaction time. Also, the dual processing capability of the terminal will allow it to be considered as the terminal device for accepting commercial debit and credit transaction processing at these retailers.

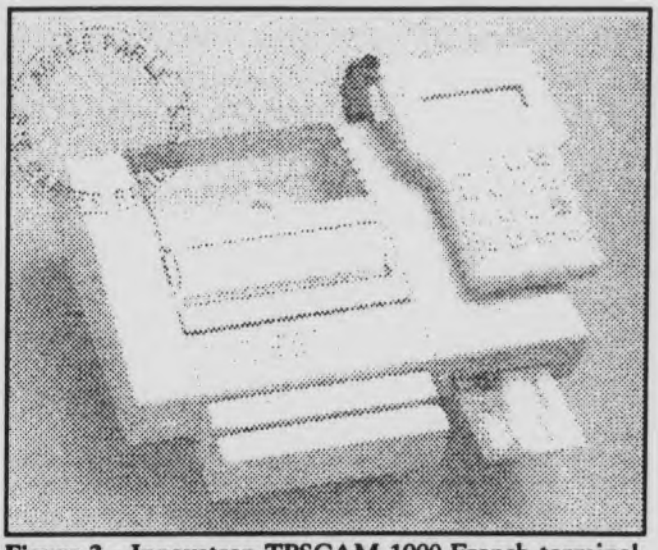

Figure 3 - Innovatron TPSCAM 1000 French terminal

Integrated Electronic Cash Registers. Integrated electronic cash registers (IECRs) are full service, check-out terminals which provide on-line check authorization, on-line debit and credit card processing, UPC scanning capability, and cash register functions. These registers are essentially computer terminals with sufficient memory and processing capability to maintain inventory and operating data files, and adequate ports to support a variety of attachments. IECRs may be used in single-lane and multi-lane stores. In multi-lane stores the registers are linked to a central computer for file management, pricing data, and debit, credit, and check authorizations. IECRs range from $3,500 to $7,500 per register depending on the functionality and memory capacity. Experts predicted that these terminals will be the way of the future for large supermarkets.

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[1] The Dayton demonstration provided all participating retailers with a PC and LAN as well as the modified Verifone terminal with card reader. The OTT 2000 consolidated all of these functions into one unit and provided sufficient memory to be used in single-lane stores. The EBT processor is currently developing an alternative solution for multi-lane retailers that will also eliminate much of the above hardware. The DataCard 485IC is the POS platform being considered and this terminal contains dual processing capability.

The requirements to retrofit IECRs to process both magnetic stripe and smart card transactions is still under investigation. Most experts believed the process would be fairly simple, requiring only the attachment of a smart card reader and the installation of the software (the necessary port and memory is resident in the terminal).

Exhibit 1, *POS Terminals*, summarizes the four categories of POS terminals, their capabilities and requirements to process magnetic stripe and smart cards.

Exhibit 1

POS TERMINALS

Terminals	Card Type	Limitations	Retrofitting Requirements	Cost New	Cost to Retrofit (per terminal)
Basic Terminal	Mag Stripe	32k byte RAM; 3 ports	Smart card reader, memory, software, re-engineering.	$250 to $300	$100-$150 plus interface software[1]
Enhanced Terminal	Mag Stripe	256k byte RAM; 5 ports	Smart card reader and software.	$400 to $700	Approx. $25 plus interface software[1]
Integrated Terminals	Both	N/A	Fully equipped.	$800 to $1,000	N/A
Integrated Cash Register	Mag Stripe	N/A	Smart card reader and software.	$3,500 to $7,500	Approx. $25 plus interface software.[1]

N/A = Not applicable

[1] The cost for interface software is dependent upon the terminal's existing capability and desired functionality.

Automated Teller Machines (ATMs)

EBT systems currently use ATMs to distribute cash benefits and can provide balance inquiries for cash and non-cash benefit recipients. The existing ATM infrastructure poses three considerations to the implementation of a hybrid system:

- the infrastructure may not be sufficient to support benefit distribution in every location throughout the country;
- the cost of ATM transactions is typically higher than that of POS transactions; and
- the existing infrastructure supports on-line, magnetic stripe processing only.

It should be noted that only the last consideration listed is unique to a hybrid system. The other two are a part of the current EBT equation. Each of these considerations is discussed below.

The infrastructure may not be sufficient to support benefit distribution in every location throughout the country.

While ATMs are widely available in most areas, a variety of factors (e.g., safety of users, vandalism) have limited their deployment in lower income areas and inner cities. Financial institutions are addressing the factors surrounding this issue in order to improve access. Deployment of ATMs in rural areas is also sometimes limited. In addition, a number of EBT evaluation projects are examining recipient access to ATMs.

The cost of ATM transactions is typically higher than that of POS transactions.

ATM transactions may pass through several commercial networks in order to connect with the card database or EBT host computer. Each of the networks charge a fee to transfer the transaction and authorization information. In addition, the "owner" of the ATM charges a fee for the use of the terminal and the value of funds distributed. While the existing ATM infrastructure is far more extensive than that of the POS infrastructure, POS systems tend to be more localized, with transactions passing through only one or two networks. As more POS networks develop, the infrastructure may mirror that of the ATM infrastructure causing prices to be more in-line with ATM transaction costs.

Off-line transactions do not require a communications link between the ATM and the processor at the time of the transaction and may therefore bypass some of the network processing charges (the "owner" fees would still apply). Off-line ATM transactions therefore may be less expensive than on-line transactions. However, since most existing ATMs in the United States are not equipped to process smart card transactions, the processing charges for these transactions cannot be determined.[1]

The existing infrastructure supports on-line, magnetic stripe processing only.

As mentioned above, most existing ATMs in the United States are equipped to process on-line, magnetic stripe transactions only. ATMs may be retrofitted to process both magnetic stripe and smart cards; however, older ATMs with limited capabilities and programmable memory may not be candidates for retrofitting.[2] ATMs are currently available from manufacturers which can handle smart cards and magnetic stripe cards.

It may be more cost effective to retrofit an ATM than it is to retrofit a POS terminal. New ATMs range in cost from $15,000 to $45,000, depending on features and capabilities. The cost to retrofit an ATM to accept and manage off-line transactions is approximately $3,500, including software development.[3] In addition, experts indicated that there are few functional limitations to retrofitted ATMs. The maintenance and performance expectations are similar to that of a newly purchased ATM with dual processing capabilities. Industry experts reported that the *incremental cost* to purchase a new ATM with dual card capability ranges from $1,000 to $3,000.

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[1] Pilot programs are testing the use of smart cards with ATMs, often with pre-paid or stored value applications.

[2] ATMs are expected to last at least seven years. However, many ATMs currently in use are between 10 and 15 years old.

[3] The cost differential to retrofit a POS terminal and an ATM is due in part to the software modifications needed on each type of equipment, and the complexity of the ATM system in comparison to a POS terminal.

Another consideration in retrofitting ATMs to process both on-line and off-line transactions is the ATM infrastructure. Existing networks and network agreements are designed to process on-line transactions. The communications networks will need to be examined to determine if existing capacities will be sufficient to handle batch transmissions. Items which are sent in batch transmissions are generally received and stored, for subsequent processing during a settlement period. This additional collection and storage capability must be evaluated and accommodated by the respective network. Additional communications nodes may also be required at the network in order to accommodate the increased communications. Many off-line systems establish transmission times during typical "off-peak" (low volume) transaction processing times to most efficiently control the processing cycles. In addition, new network agreements will be necessary to link networks and processors.

AVAILABILITY OF TRANSACTION PROCESSORS WHICH SUPPORT ON-LINE AND OFF-LINE PROCESSING

Typically, transaction processors support either on-line or off-line processing. Most experts believe existing processors will be willing to expand their processing capabilities to include both processing alternatives. The technical requirements and configurations for on-line and off-line processing centers are similar in hardware,[1] telecommunications, and data file management. However, conversations with two of the leading EBT processors indicated that neither processor was currently planning to expand their current capability to include both on-line and off-line processing. The processors would more likely develop a team approach to support a hybrid system. This assessment does not preclude the entry of new processors which may develop both applications.

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[1] The hardware requirements for an on-line system may be higher than those of an off-line system because of the increased resource requirements during peak transaction periods. Off-line systems avoid peak transaction periods by processing transactions in batch during retailer settlement.

THE IMPACT OF HYBRID EBT SYSTEMS ON THIRD PARTY PROCESSORS

Third party processors include retailers and network operators which receive and route electronic transactions. Third party processors in the United States are primarily configured to support on-line, magnetic stripe transaction processing.[1] The capability of these processors to support hybrid transaction processing and the potential impact hybrid systems may have on third party processors is discussed in this section.

There are four basic areas of considerations: terminal deployment, software development or licensing, telecommunications, and third party host capabilities.

- Terminal Deployment - Point-of-sale terminals can be retrofitted to support both on-line and off-line transaction processing (see this chapter, *Availability of Terminals Capable of Supporting Hybrid Systems*). The primary consideration or impact is the cost to retrofit existing terminals ($25 - $150 plus the cost of interface software to support the new processing technology) or to deploy dual purpose terminals.

- Software Development - The third party would be responsible for developing or licensing the software to support the off-line transaction processing (e.g., read the IC chip card, store the transaction data, update, or write to, the card, etc.). It should be noted that there are few operating standards for IC cards and off-line transaction processing. Therefore, each off-line application may require its own unique operating system and software.

- Telecommunication Configurations - The dial-up and dedicated lines used to support on-line transaction processing are usually sufficient to accommodate off-line transaction processing. Therefore, existing telecommunication configurations would not necessarily have to change in order for third party processors to support both on-line and off-line processing. However, if off-line transactions were transmitted *directly* to the EBT host while on-line transactions continued to be transmitted to the third party processor, software development would be necessary to program POS terminals or store controllers to identify, sort, and route transactions to the appropriate destination.

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[1] Third party processors may store magnetic stripe transactions for batch processing at a later time. This process is referred to as off-line processing though it differs greatly from the off-line processing of IC chip transactions.

- Host Capabilities - The capability of the third party host to store off-line transaction data for batch transfer to the EBT host would need to be developed.

Two approaches have been identified for integrating off-line processing with existing on-line third party processors. The Off-line Processing Approach imitates the Dayton, Ohio, off-line EBT system. Off-line card maintenance and issuance files are stored within the POS terminal or store controller (i.e., personal computer). Off-line transactions would be authorized at the POS terminal and uploaded to the EBT host during retailer settlement. On-line transactions would continue to be transmitted to the third party host for real-time authorization.

The second approach is modeled after on-line transaction processing. Off-line card maintenance and issuance files are stored at the third party host. All transaction requests, both on-line and off-line, would be transmitted to the third party host for authorization. Off-line transactions would be authorized by the third party host based upon information both on the card and in the card maintenance files. Off-line transactions would be stored at the third party host for batch processing to the EBT host during third party settlement. On-line processing would remain unchanged.

Off-line Processing Approach

The Off-line Processing Approach requires significant modification and enhancement to on-line POS terminals and in-store configurations. POS terminal would require smart card readers, read/write capability, and sufficient memory to support the application software. In addition, store controllers or POS terminals with significant memory capability would be required to receive and maintain card maintenance and issuance files. Transaction processing would occur as described in Chapter 2, *Off-line EBT*.

The transmission of data at settlement between the retail store and the EBT host may be accomplished in one of two ways: a direct connection between the retail store and the EBT host or via third party processor involvement. To transmit directly to the EBT host, a dial-up telecommunication line would suffice to provide access to the EBT host. On-

line transaction would be transmitted to the third party processor over either the same, or different, dial-up facility or dedicated line (a dedicated line would send all transactions form the retailer to one destination. To facilitate the selection of transactions for appropriate transmission, the POS terminal would require the ability to identify and sort transactions either by prompting users to select the *type* of transaction (e.g., current POS systems at retailers often prompt shoppers to indicate debit or credit transactions) or identifying the transaction type by the routing number on the benefit card (this option would require single processing cards; on-line or off-line only).

Transmitting between the EBT host and POS terminal may be accomplished through one of two methods. The first would be to by-pass the third party processor and route transactions directly to the EBT processor. To accomplish this, the third party processor would be responsible only for deploying POS terminals with both on-line and off-line processing capabilities. The retailer would be responsible for entering into an agreement with the EBT host for off-line transaction processing services. The second method would be to transmit transactions to the EBT host via the third party processor. The third party's host system would require modification to receive, sort, and route batch transmissions to the EBT host.[1] The off-line issuance and hot card files would be maintained at the POS terminal or store controller, the third party processor would serve only to route these files between the retailer and the EBT host. No additional service or processing would be provided by the third party. An incremental fee would likely be applied by the third party for routing transmissions.

On-Line Processing Model

The other approach to integrating off-line transaction processing with on-line third party processors is to imitate on-line transaction processing. This approach requires less extensive modifications to the POS terminals and in-store configurations, but would require significant modification to the third party host. Each POS terminal would be retrofitted to

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[1] Sorting of off-line transactions would be necessary if multiple off-line programs are accessed off-line.

include a smart card reader, read/write capability, and sufficient memory to support the application software, but no additional memory or in-store PC would be necessary to maintain the card maintenance and issuance files. Card maintenance and issuance files would be maintained at the third party host. Transaction processing would require an on-line communications link to the third party host. The host would receive the outstanding benefit balance along with the transaction request. The third party would determine if the card was listed on the host card file. If it was not, a temporary benefit account would be established on the third party host. The third party would then post to this account any staged transactions or benefit adjustments and approve the transaction based on the remaining available balance. An authorization message would be transmitted back to the POS terminal along with the transaction approval and benefit adjustments for update to the benefit card. At the end of the settlement day, the third party would transmit the transaction data to the EBT host.

Industry experts indicated that the approach and role of third parties would be determined by the extent of off-line processing. If only a low volume of off-line transactions are anticipated, third party processors would most likely participate in the deployment of dual-processing terminals, but would probably not make the necessary modifications to their operating systems to accommodate off-line processing. Therefore, off-line transactions would need to be transmitted directly between the retailer and the EBT host. Third parties could continue to be utilized for on-line transaction processing which would include hybrid scenario number four, *off-line security and on-line transaction processing*, since the actual transaction processing would occur on-line.

THE OUTLOOK FOR DEPLOYMENT OF SMART CARD BASED FINANCIAL PROCESSING SYSTEMS

The existing infrastructure in the United States was developed to support on-line transaction processing. To date, there has been no significant entry of smart card technology to warrant changes in the infrastructure. However, interest in smart cards has increased throughout the last decade and the application of this technology has been adopted extensively in European countries. For example, as of 1991, the electronic funds

transfer (EFT)/POS network operated in France by the Groupement des Cartes Bancaires (CB), of which nearly all retail financial institutions in France are members, had issued approximately 20 million cards, of which approximately 12 million were integrated circuit (IC) chip cards used for authorization. There are EFT/POS terminals installed at 250,000 retail outlets, of which 150,000 terminals are capable of reading both magnetic stripe and IC chip cards.[1] The number of these terminals continues to grow steadily.[2] It should be noted however, that there are a smaller number of financial institutions in France than there are in the United States, and that the French government supported the development of the off-line infrastructure.

Many experts believe there will be similar evolution to smart card technology in the United States, in one form or another.[3] However, in general, experts agreed that smart cards would not make a significant entry in the United States until the 1997-2000 timeframe.

Earlier in this report, the term "smart card" was defined as a plastic card containing an IC chip. The IC chip on the card can be programmed to perform specific functions. Some are used as information storage devices (e.g., the French telephone cards), while others are used to maintain current balance information which can be updated based on a variety of conditions (e.g., the cards used in the Dayton off-line EBT demonstration). In this section, we will examine the types of applications that may be deployed in the U.S.

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[1] Payment Systems: Strategic Choice for the Future, Hitachi Research Institute, Tokyo, Japan, 1993.

[2] Mr. Paul Trecasses, Director, Groupement Des Cartes Bancaires, reported at the First Annual Meeting of the Smart Card Forum (September 30, 1993) that all cards issued by CB were IC cards.

[3] The development of various associations (e.g., Federal Smart Card Users Association Smart Card Forum) and the inclusion of smart cards as a major track in conferences, such as SecurTech/CardTech, are indications of the increased interest and support for smart cards.

The experts interviewed indicated that there were three areas that they believe will drive the development of smart card applications. They were:

- pre-paid cards (open and closed systems);
- security; and
- government applications such as EBT or health cards.

Pre-paid Cards

Pre-paid cards describe a class of applications in which a card is substituted for cash. While many pre-paid card applications utilize magnetic stripe technology (such as the Washington Metro fare card), several financial institutions in the United States are currently investigating or experimenting with the use of smart cards for this application. European adaptation of smart card technology is extensive. Throughout France, almost all public telephones require the use of a smart card rather than the input of coins. In fact, few public telephones still accept coins. The telephone card is a "cheap" smart card containing only a memory chip with no processing capability. Cards can be purchased at newsstands, in Post Offices, or in many other retail outlets. The cards can be purchased in several different denominations. These cards are either thrown away or recycled once the value is used up. A more elaborate application of pre-paid cards is known as the "electronic purse." The use of the electronic purse card is similar to the telephone card, except that it contains some processing capability which is used to provide PIN protection and it can be replenished rather than discarded. Value can be added to the card at ATMs, POS devices or through a home banking application. Both the telephone type card and the electronic purse are being investigated by U.S.-based institutions.

Figure 4 - An example of a pre-paid smart card

CoreStates (which also operates the MAC ATM network in Pennsylvania, New Jersey and several other states) has been very active in developing and testing pre-paid card technology. While they have only issued cards to bank employees for use in internal vending machines and other devices, they are planning on an extended demonstration in the near future. The card has several perceived advantages:

- it projects a "high tech" image that is favorable to marketing campaigns;
- it has potential for increased earnings for the card issuer on funds used to purchase the card while the funds remain unspent; and
- it is believed that some portion of the value on the card will never be used resulting in increased income for the card issuer.

The value to the merchant is the reduction in costs associated with handling cash as well as increased security. Vending machine theft could be significantly reduced. Similarly, the value to the consumer is the reduced need to maintain pockets full of change, and increased security and convenience. Eventually, it is believed, the need for cash could be significantly reduced if cards could be replenished through a home banking application in which the consumer could access their bank account from a terminal in their house and transfer value from their account to the card on demand.

It was noted by the industry experts that most pre-paid card systems are "closed systems" in which the card issuer is also the transaction acquirer. A closed system does not require standard operating software to accommodate multiple types of smart cards or readers and does not require interchange agreements with other card issuers or transaction acquirers to effect funds settlement. While an open, pre-paid smart card system is certainly possible, it would require that all terminals be able to read all smart cards (or that all smart cards adhere to a standard operating system) and that interchange agreements be negotiated. It is unlikely that either of these two requirements will be established within the near future.

Security

Smart cards provide additional security features over the current magnetic stripe cards.[1] In France, the introduction of IC chip cards has resulted in increased security. It is reported that "France is the only country with a declining card fraud rate, contrary to the increasing world-wide trend." Groupement des Cartes Bancaires reports that payments by Carte Bleu (a common French credit type card similar to VISA) increased from 380 billion French francs (FF) in 1990 to 475 billion FF in 1992. During this same period, fraud decreased from 703 million FF to 533 million FF.[2] For this reason, many of the experts believe that in the future, the security features of smart cards may be used for identification purposes on credit and debit cards, with the transaction completed on-line. However, due to the limited use of smart cards in the U.S., the experts generally believed that PINs and/or photos on magnetic stripe cards would be the next step for credit card security. And, while most industry experts believed that smart cards currently provide better security than magnetic stripe cards, alternatives for enhancing magnetic stripe card security are being developed.[3]

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[1] Smart cards use a number of key encryption techniques to ensure that the card may not be counterfeited or scanned and that all transactions are completed with the original card and PIN. Magnetic stripe cards do not have sufficient memory to incorporate similar encryption techniques and have proven susceptible to card fraud including counterfeiting and scanning.

[2] "Key Facts and Figures - 1993", Groupement des Cartes Bancaires, Paris France. The first smart cards were issued in 1986 and the decision to put smart cards into general use was made in 1990.

[3] Several industry experts identified Watermark Magnetics and HoloMagnetics as alternatives for increasing security on magnetic stripe cards. Watermark Magnetics uses a special magnetic code which is placed on the stripe during production. The magnetic particles on the stripe are arranged into a specific pattern during processing; the stripe is later encoded like a standard magnetic stripe card with the watermark code written to the card for use as an encryption key. Existing magnetic stripe readers can read these cards; however, the encryption feature can only be used with terminals designed to read and interpret the code.

HoloMagnetics uses repeating patterns of holographic images which are encoded on the card at the time of production. An optical scanner is used to read the code and interpret the validity of the card. The magnetic stripes produced using holomagnetics are

Another application of smart cards in the U.S. could be to diminish the need for on-line credit authorizations for credit card sales. Most credit card sales are authorized via a communication link to a central database that verifies the validity of the card, checks against a list of cards that have been reported lost or stolen, and validates that sufficient credit is available to complete the purchase. In some instances, if the purchase value is small, the sale may be authorized without central validation of the credit limit (commonly known as sales below the floor limit). The floor limit is established based upon profiles of sales at the merchant location. Smart cards could be used to store demographic information on the cardholder such as credit history, average purchase amount, frequency of purchases and other statistical data that could be used to provide a customized floor limit. Using this technology, a smaller number of on-line authorizations would be necessary. There are two limitations to the implementation of this application. First, on-line authorization of credit sales is a relatively inexpensive transaction (less than $0.10 per transaction, and in some cases, free), and second, there would be no current validation that the card has not been reported lost or stolen resulting in somewhat higher risk. Therefore, it is more likely that the primary application of smart cards in the POS infrastructure would be to increase security through immediate PIN validation and elimination of easy counterfeiting. Using the card as a device to minimize telecommunications is a potential add-on to this application once the infrastructure (POS devices with dual capability) is in place.

The issue of fraud is of great concern to the credit card industry, where purchases can be made without the use of PINs at POS devices, and without any identification through mail order - often with delivery to another address. Experts agreed that the credit card industry experiences much of its fraud through the merchants, and the exposure limit is higher on credit cards than it would be in the Food Stamp Program where the maximum dollar amount in a given month is relatively low.

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visibly different than standard magnetic stripes and require additional equipment in the card reader to interpret the stripe.

Government Applications

Several experts indicated that the driving force behind the adaptation of smart card technology in this country could be the influx of government applications. They cited the emergence of multiple applications by the Department of Defense, the off-line EBT demonstration in Ohio, the WIC EBT demonstration in Wyoming and the potential for a national health card. In addition, the report of the National Performance Review states that:

> "In the future, the concept of electronic government can go beyond transferring money and other benefits by issuing plastic, "smart" benefit cards. With a computer chip in the card, participants could receive public assistance benefits, enroll in training programs, receive veterans services, or pay for day care. The card would contain information about the participant's financial positions and would separately track their benefit accounts - thus minimizing fraud."[1]

While a lack of standards (both technical and processing) and a high investment cost are likely to mitigate against any large-scale government application, these demonstrations and public statements serve to generate significant interest in private sector investment and analysis. The Smart Card Forum, a recently formed consortium of major companies associated with card technology, is planning major efforts to evaluate and foster the application of smart cards in the United States.

THE COST CONSIDERATIONS OF IMPLEMENTING AND OPERATING HYBRID EBT SYSTEMS

There are many cost factors which could affect the decision of which type of EBT system to use. Chapter 5 explores the economics of the hybrid scenarios outlined within this report; the cost implications are addressed below.

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[1] Vice President Al Gore, et al., *Creating A Government That Works Better & Costs Less*, Washington, DC, September, 1993, page 114.

A variety of issues affect the potential costs involved in establishing and maintaining an on-line, off-line, or hybrid system. Depending upon the manner in which a hybrid system is utilized, these costs could reach as high as twice the cost for using a single system. The cost implications which factor into a decision for selecting to use a hybrid system include telecommunications, terminal deployment and capability (existing and planned), transaction fees, issuance files, training, number of systems and support requirements.

Telecommunications

The issues surrounding telecommunications encompass the use of dedicated or dial-up lines to handle on-line transactions, sending batches of transactions (off-line) versus individual transactions (on-line), and the reliability of the telecommunications system which is operating in the EBT area. For example, if the existing telecommunications network experiences outages or slowdowns at particular times of the day, the use of an on-line system may not be practical with delays in authorizing transactions or system unavailability at times of frequent usage.

POS and ATM terminal deployment

The existing infrastructure is an important facet in the selection of an EBT system. In areas where on-line systems are not prevalent, using an off-line system may prove a more cost effective solution since the benefit of piggybacking EBT transactions on an existing network or infrastructure would not exist. In areas where on-line POS and ATM systems already exist, and are widely available, an off-line system may not be a cost-effective system. With the existence of an on-line system using magnetic stripe access cards, the selection of alternative card access devices may not be practical without the need to retrofit or re-equip card readers to handle additional types of cards (such as IC chip or optical cards).

Even without the possibility of installing new terminals or modifying existing terminals to accommodate different cards, it is possible that the existing infrastructure in the region is not diversified enough to meet the accessibility and convenience requirements

associated with the electronic delivery of benefits. While utilizing the existing infrastructure, there may be a need to deploy additional ATMs and POS to meet the EBT requirements of the specific programs.

Transaction Fees

Fees associated with processing transactions must be reviewed for each type of system and card access device prior to selection. Fees are currently associated with ATM and POS transactions, and generally increase as a transaction passes through network switches on its way to authorization. POS transaction fees tend to be lower than ATM fees, and retailers may be able to negotiate lower fees based upon the volume of transactions which would be processed over the system. In contrast, batch transactions also incur fees when the items are sent at particular times of the day, however these charges tend to be telecommunications-based, rather than POS-based. ATMs do not use off-line processing.

Issuance Files, Training, and Support

In an EBT system, each benefit program is responsible for creating issuance files and delivering those files to the processor. A hybrid system could require the benefit program to create and send authorization files to two different systems. When issuance files are directed to two systems or processors, additional costs are incurred by the program agency to monitor and track authorization amounts, which system each recipient uses, and how training is conducted for recipients. In addition, if one benefit program issues two different types of cards to its recipients, card stock must be separately maintained and reconciled. With two types of access cards, customer service will need to be prepared to handle inquiries from retailers and recipients concerning either card.

Chapter 4

WHAT ARE FEASIBLE PROGRAM ALTERNATIVES FOR COMBINING ON-LINE AND OFF-LINE TECHNOLOGIES?

Various models combining the use of both on-line and off-line technologies can be conceived. In order to focus the discussion of feasibility with the industry experts, four hybrid scenarios were developed. The four scenarios illustrate the range of potential ways that an IC chip card and magnetic stripe card system could be expected to interface in an EBT environment. As discussed earlier in this report, the four scenarios include:

- on-line or off-line EBT systems based upon geographic area;
- one benefit program on-line and one benefit program off-line operating within the same geographic area;
- one benefit program accessed via on-line and off-line technology; and
- off-line security and on-line transaction processing.

The discussions of these scenarios provided substantial data to support conclusions regarding two issues of concern to the Food and Consumer Service (FCS). These issues are:

- The impact of an expanded off-line EBT system on the achievement of interstate compatibility for food stamp transactions.
- The impact of an EBT system utilizing both on-line and off-line technology on program management and/or costs.

This Chapter provides a more detailed discussion of each of the four scenarios and discusses, where applicable, the conclusions that were reached by the experts regarding these two issues in the context of each of the hybrid scenarios.

HYBRID SCENARIOS

Industry experts were contacted to discuss each of the above four scenarios, and while the experts all agreed that each of the scenarios could be technically feasible using current technology, some of the scenarios may not be practical or operationally feasible.

The current EBT systems have been implemented using magnetic stripe cards for on-line systems and smart cards for off-line systems. The experts noted that on-line systems could use either magnetic stripe or IC chip card technology.[1] They also noted that many current commercial credit card systems, using magnetic stripe technology, operate in an off-line mode. Transactions are authorized using an in-store floor limit with the merchant transmitting a batch of transactions to a central database at the end of each day. Even transactions for which an on-line authorization is obtained (either via a terminal or via phone) are stored at the merchant site for settlement (transmission to a host) at the end of the day. Therefore, some of the distinction between on-line and off-line systems can be muted when considered in the context of existing commercial systems.

Scenario 1: On-line or Off-line EBT Systems Based Upon Geographic Region

In this scenario, recipients would be issued *either* a smart card or a magnetic stripe card, based upon where they reside within a state. The smart card would be used to access benefits through off-line transaction processing and the magnetic stripe card would be used to access benefits through on-line transaction processing. Because this scenario uses two distinct transaction processing approaches, there would be separate databases maintained for those recipients accessing their benefits through the on-line system and those accessing benefits through the off-line systems. Essentially, two EBT systems would be operating independently in different locations witnin the state. Two EBT processors could be providing

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[1] The chip would contain similar information to the data contained on a typical magnetic stripe. The terminal could read this information and use it to establish an on-line connection to a central database.

the on-line and off-line processing, though the scenario would not preclude one EBT processor from providing both processing systems.

All other operating characteristics that are identified with on- or off-line systems would remain unchanged in this scenario. For example, benefit issuance information would be provided by the state or local agency to the appropriate processor. In an on-line system, the benefit information would be maintained at the central host computer, while benefit information in an off-line system would be loaded onto the recipient's card. In order to replace benefits from lost or stolen cards, a duplicate database would be maintained at the off-line system processor. This database would be updated following retailer settlement to reflect all off-line transactions performed during that period.

All benefit programs within an area would be delivered in the same manner. The decision of which areas provide benefits to recipients off-line, and which provide benefits on-line would be determined by the state, based upon a review of each area's unique circumstances. This scenario is envisioned for use in states where factors such as the existing infrastructure (terminal deployment), existing telecommunications systems, or natural geographical separations dictate that the recipients would be better served through the use of the two processing capabilities. If one area has a dense deployment of terminals that are used for processing debit and credit transactions, it would seem to make sense to use this infrastructure. However, if another area in the same state is segregated from this "on-line" area by a natural boundary (e.g., a mountain range, great distance, or both), an off-line system may be a more appropriate solution.

There has been considerable discussion that off-line EBT may be better suited for rural environments because of the lack of adequate, or poor quality, communications facilities. Discussions with industry experts indicated that telecommunications capabilities in rural and urban areas are not, in most cases, substantially different and that the decision to implement an on-line or off-line system solely on this basis is not warranted. Telecommunications advances within the past four years have reduced the possibility of rural areas having less developed systems. Part of the reason for this has been the advent of

satellite and digital communications. Industry experts also pointed out that poor quality telecommunications in rural areas may in fact be more detrimental to an off-line system than to an on-line system. The example provided by one of the experts was that off-line systems required a longer individual transmission period (to upload and download information) than that required for an individual on-line transaction (a purchase), thereby increasing the likelihood that the transmission would be affected by the poor quality.

While the communications capabilities of an area do not seem to warrant one system over another, the experts noted that the cost of telecommunications may be a determining factor in which type of EBT processing environment to deploy in a given area. An example provided to us was the higher cost that could be incurred by an on-line system in a dense urban area with thousands of recipients. An off-line system in this same area may result in a lower telecommunications cost. Telecommunications costs represent a significant cost issue which should be further examined.

Furthermore, some experts pointed out that the benefit of an off-line system was the avoidance of on-line telecommunications as well as network fees, and that an off-line system may be more cost-effective in areas in which high transaction volumes could be expected. They believed, therefore, that an off-line system may be more cost-effective in dense urban areas in which many on-line transactions would be transmitted over existing commercial networks incurring network interchange fees and that, in addition, the higher volume of transactions could serve to mitigate the higher card and terminal costs of an off-line system. They believed that an on-line system could be more cost-effective in rural areas in which low transaction volumes are expected and in which a terminal may be more likely to directly connect to the host rather than to a commercial network.

Drawbacks

There are two main drawbacks to this scenario. The first is that it could limit the areas in which recipients can access their benefits. The limitation on access to benefits is caused by the incompatibility of the two systems as well as the lack of interchange standards

between EBT systems. This is similar to the situation that exists now for recipients who are in EBT areas who desire to shop in non-EBT areas. To a certain extent, any inconvenience to the recipient has been partially relieved by the creation of what has become known as a "border store." These are stores that are not within the official EBT area (i.e., state, county, etc.), but are equipped with EBT terminals. However, in this scenario, it would be necessary to equip "border stores" with equipment capable of reading and processing both magnetic stripe and smart cards. This equipment could allow recipients living in the "off-line area" to shop in the "on-line area" and recipients in the "on-line area" to shop in the "off-line area." This could be accomplished through retrofitting the terminals or by deploying integrated terminals in the border area.

As an alternative to equipping border stores, manual transactions by out-of-area retailers could be allowed. Retailers in an off-line area accepting transactions for an on-line area recipient could be relatively sure that the funds are available in the recipient's account by obtaining authorization through a telephone call to the recipient's EBT host. Off-line transactions, on the other hand, would be authorized against the host database which may not reflect the current available balance held on the card. Therefore, the retailer would be at risk of accepting a transaction with insufficient funds remaining in the recipient's account. Notwithstanding the above discussion, when one state has two different operating EBT environments, it may be able to include within the vendor contracts a reciprocal agreement between the processors whereby the two would allow retailers from outside their processing area to initiate manual transaction processing. Paper routing, liabilities, and settlement processing would be controlled by the reciprocal agreement. Absent this cooperative agreement, "within" state border stores would need to be established with both on-line and off-line capabilities which route the transaction back to the appropriate processor.

The second drawback is that implementation of two dissimilar systems will result in higher costs than implementation of a single system and most likely will exceed the implementation costs of two similar systems. Most experts indicated that dual EBT systems could result in higher overall development and operating costs than if one system were deployed. This would especially be true with two processors since the economies of a single

host computer system, one customer service area, retailer help desk, and other administrative functions could not be combined. Retailer training costs could increase if retailers were required to follow separate procedures based upon card type, processing manual transactions for each "out of area" recipient. Also, implementation of the dual system will result in higher terminal costs than a full on-line system.

Advantages

Interviewees cited as advantages the ability to piggy-back on an existing POS infrastructure, and to use the most cost-effective delivery method for benefit distribution and redemption.

Scenario 2: One Benefit Program On-line and One Benefit Program Off-line Operating Within The Same Geographic Area.

This scenario requires a multi-benefit program environment, where one program would be available to recipients through an on-line system (using magnetic stripe access), while another benefit program would be available through an off-line system (using an IC chip card). Recipients eligible to participate in both benefit programs would receive one benefit card with an IC chip and a magnetic stripe. Recipients eligible to receive benefits supported by the magnetic stripe would receive a card with a magnetic stripe only.[1] However, recipients eligible to receive benefits supported by the IC chip would receive a card with both a magnetic stripe and an IC chip. Industry experts believed all IC cards in this scenario should include a magnetic stripe for the following reasons: 1) the incremental cost of adding the magnetic stripe to an IC card is nominal; 2) If the recipient later qualifies for the second program, a new card would not need to be issued; and 3) recipients on both programs would require a card containing both technologies. Therefore, administrative procedures are somewhat simplified by not issuing a third type of card with only an IC chip to recipients on the one program.

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[1] Participants would identify the program from which benefits should be taken at the time of purchase, as they do today.

If a benefit recipient with a magnetic stripe card later became eligible for a program supported by an IC chip, the recipient would be issued a new card with both an IC chip and a magnetic stripe. If a recipient originally participating in a benefit program supported by an IC chip became eligible for a program supported by the magnetic stripe, the magnetic stripe on his or her existing card would be encoded with the appropriate information for the new program. No additional card issuance would be required.

All other operating characteristics that are identified with on- or off-line systems would remain unchanged in this scenario. For example, benefit issuance information is provided by the state or local agency to the appropriate processor. In an on-line system, the benefit information is maintained at the central host computer, while benefit information in an off-line system is loaded onto the recipient's card. In order to replace benefits from lost or stolen cards, a duplicate database is maintained at the off-line system processor. This database is updated following retailer settlement to reflect all off-line transactions performed during that period.

Drawbacks

Many of the issues identified by the industry experts associated with this scenario are similar to those that would be encountered in any multi-program EBT system. These issues include:

- Coordination of card issuance across programs. Which agency would be responsible for card issuance? Could a single agency manage all card issuance even if different offices were responsible for eligibility determination? In a hypothetical example, if a recipient receiving SSI benefits were issued a magnetic stripe card and then visited a state welfare office to receive food stamp benefits, would the Food Stamp Program issue a new card with a stripe and chip to replace the previously issued card?

- Coordination of card replacement and card management. Which agency would be responsible for issuing replacement cards? Which program would bear the costs of the new card? Would the cost of the card be allocated according to the technology used?

- The use of a dual purpose card at a POS terminal would likely require the initiation of two or more transactions, one for each program benefit accessed, as the EBT systems currently handle multiple benefit transactions.[1] The number of transactions would increase if *cash* benefits were accessed through both technologies, and benefits accessed through the first technology (e.g., magnetic stripe) were depleted, resulting in one magnetic stripe cash transaction and one IC chip cash transaction.

None of the above issues was viewed to be insurmountable; however, these issues are complicated by the use of multiple technologies. For example, if all programs were using a magnetic stripe card, then the issue of which program issues the card is less complex. Similarly, if all programs utilized a chip card, then the question of cost allocation is less controversial since proportional costs could be allocated across programs without consideration of which program is using which technology.

Most experts believed that implementation and operation of the system depicted in this scenario would be significantly more complicated if more than one EBT processor were used. Areas such as card issuance and control, error resolution, and customer service would be significantly affected. Almost all interviewees indicated that dual EBT systems could also result in a higher overall development and operating cost than if one EBT system were deployed. This was especially true if two different EBT processors were used, thereby foregoing any economies that may have been gained from using a common host computer system to process both on- and off-line transactions, the use of one customer service function, retailer help desk, and other shared administrative functions. The use of two different benefit delivery systems would require additional retailer and recipient training. Training may be provided as a joint effort of the benefit programs, to ensure that retailers and recipients understand the procedures to follow under each type of program.

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[1] In current EBT systems, two transactions are processed when recipients make purchases with food stamp and cash benefits. Although not used in the current EBT demonstrations, experts indicated that it is possible to handle both purchases with a single transaction for authorization.

The apparent consensus of the experts was that there was no technical reason why two technologies could not coexist on the same card. However, there would be little, if any, linkage between the two technologies, other than sharing a common plastic carrier. As discussed in the next section, they felt that the advantage of this commonality was in the merging of card issuance and management procedures but that a potential disadvantage was that if the card was lost, the recipient would be precluded from obtaining benefits from all programs rather than a single program associated with a particular card. This was acknowledged as a potential disadvantage to any EBT program that combined multiple programs on a single card. They also noted that this scenario would require installation of terminals that would accept either technology. They summarized the disadvantages by suggesting that this scenario required issuance of cards with both technologies to a large proportion of the population, installation of smart card capable terminals in almost all POS locations, and building and management of two host processing systems. They therefore believed that this scenario, other than sharing POS terminals, was analogous to building two separate EBT systems and incurring all the costs associated with this activity. They believed that a commitment to one technology or the other would result in lower overall costs to the government.

Advantages

Most of the experts agreed that this hybrid scenario makes the best use of the existing POS and ATM infrastructure and provides the flexibility, from a national perspective, to allow certain programs (such as WIC) to be tailored to the issuing area. The established ATM systems utilize local, regional or national network infrastructures to deliver cash. Ultimately, there could be EBT operating standards and processor agreements that would allow the use of any magnetic stripe EBT card to access cash benefits at any ATM or POS device in the country.[1]

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[1] Before nationwide EBT could be provided for the Food Stamp Program, procedures would need to be developed to ensure that transactions made outside of the recipient's processing area were made at authorized food retailers.

Experts also believed that this scenario, depending on which programs were delivered on- and off-line, provided retailers with the most flexibility. For example, if all benefits were provided on-line except WIC, the number of retailers or vendors which would need a terminal that could read an IC chip would be limited to the number of WIC vendors. Likewise, from a program perspective, WIC EBT requirements could be determined on a state-by-state basis, and not carry with it any national ramifications.[1]

Scenario 3: One Benefit Program Accessed Via Both On-line and Off-line Technology

In this scenario, one benefit program (e.g., food stamp benefits), or benefit account, could be accessed through both on-line and off-line technologies interchangeably. The method of access for on-line transactions would be through the use of a magnetic stripe and for off-line transactions an IC chip would be used. There could be one EBT processor for the benefit program supporting both the on-line and off-line processing. Each recipient would receive a plastic benefit card that had an IC chip and a magnetic stripe. In addition to a recipient's account balance, the IC chip would contain all the necessary data to interface with the POS device. The magnetic stripe would not contain an account balance. Off-line transactions would be authorized and posted to the benefit balance maintained on the card while on-line transactions would be authorized and posted to the account balance maintained at the central database.

Recipients would continue to shop at authorized retailers and bring their selections to the check-out lane for purchase. If the retailer was operating in an on-line environment the benefit card would be "swiped", the PIN and transaction amount would be entered, and an on-line connection to the host computer would be made. Assuming the correct PIN was entered at an authorized retailer terminal and sufficient funds were in the recipient's account, the purchase would be approved. If the purchase was approved, the recipient's balance would be updated at the host computer and the transaction would be placed in a pending file, to be included in the retailer's next settlement.

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[1] Discussion is limited to WIC EBT requirements and not WIC nationwide regulations.

If the recipient shopped at a retailer with off-line capability only, the benefit card would be inserted into the POS device's card reader, the PIN and transaction amount would be entered, and the balance on the card would be read by the retailer's POS device. If approved, the amount of the purchase would be deducted from the available balance on the card. The transaction amount would be stored on the retailer's system and during settlement the transaction information would be uploaded to the EBT processor's host computer.

During settlement, on-line transactions that were posted to the balance maintained on the host would be aggregated by recipient and downloaded to retailers who processed transactions in an off-line environment. These transactions would be posted to the IC chip the next time the recipient used the card at an off-line retailer.[1] As stated above, during settlement, the off-line transactions maintained on the retailer's system would be uploaded to the EBT host for updating of the EBT host computer balance.

Drawbacks

Several drawbacks to this scenario were identified by the experts. First, there was a major concern that this scenario, if implemented as presented, would provide too much exposure to excess benefits being provided to recipients. There was too much opportunity for a recipient to use the entire amount of the benefit maintained on both the host database and IC chip database prior to settlement updating.[2]

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[1] Downloading the net on-line activity to be loaded to the card could allow the recipient to overdraw the benefit account. For example, if a recipient were to use the card at an off-line retailer immediately prior to the download, the on-line balance would be greater than the balance on the IC chip.

[2] There are a number of design approaches which could limit this exposure, such as the uploading of off-line transactions (to the host) and downloading of on-line transactions (to the retailer) at the time of the next on-line transaction. The effectiveness of this approach is dependent on the frequency of updates between the card balance and the host. However, assurance of eliminating all overdrafts can only be achieved by updating the balance on the card and the host with each transaction. If this strategy was implemented, there would be little difference between the on- and off-line transactions and the state would incur the telecommunications costs of an on-line system combined with the card and terminal costs

The second drawback cited was the effort that would be needed to reconcile the account balances maintained on the two databases. Reconciling the benefit account balance is complicated under this scenario. On-line transactions access the account balance that is maintained at a central database, reducing the available funds. Off-line transactions are uploaded to the processor during settlement each day, and are posted against the available balance in the benefit account. Likewise, the dollar amount of the day's on-line transactions is downloaded (with the hot card information) to retailers so that it can be posted to the appropriate recipient's smart card balance at the time of the next transaction. In addition, new issuances are downloaded to retailers so that the funds may be posted to the recipient's smart card balance.

A third drawback mentioned was the potential size of the database of downloaded on-line transactions that would need to be maintained at each off-line retailer. Theoretically, all on-line transactions, or daily aggregated transaction totals, would need to be maintained for all recipients regardless of whether the recipient would ever conduct an off-line transaction. It was recognized by those interviewed that fine-tuning the design (e.g., "expiration" of balances maintained on the IC chip of an active on-line user) could mitigate this potential problem.

A fourth drawback stated was the higher cost that could result from developing a system capable of both on- and off-line processing and supporting the reconciliation effort.

The industry experts identified a potential variation of this scenario that would, to a limited extent, resemble plans for prepaid cards in the commercial sector. This variation would provide the recipient with the capability to move funds between the chip and the on-line host. If the recipient was visiting a retailer (or geographic area) equipped with off-line terminals, they could visit a location with a terminal capable of reading both technologies and initiate a funds transfer transaction. This transaction would result in a debit to the host

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of the off-line system.

database balance and a credit to the card balance. The card balance could then be used to authorize purchases at the off-line retailer. This strategy would ensure that recipient overdrafts could not occur and that the sum of value on the card plus the value in the host database would not exceed the total value of the recipient "account".

When a card is reported lost or stolen, the account balance at the central host computer would be blocked, leaving the chip balance exposed. Depending upon the cost-benefit of handling hot card files to block the exposed chip balance, the hot card files could be downloaded to the retailers within the region.[1]

Retailers will be able to select the type of system that best meets their needs. Large grocers may select an on-line system which would handle credit and debit card transactions, while small convenience stores may be more attracted to a system which would interface with a stored value debit card.[2] Recipients would be trained on transferring value to the smart card and monitoring their account balance. The processor's central host computer would maintain a balance (accurate to within a 24-hour period) which could enable benefit replacement in the event of a reported lost or stolen card.

The major drawbacks to this variation of the scenario include the requirement of more sophisticated recipient training as well as advanced planning by the recipient to anticipate the type of equipment or transaction that would be required by particular retailers. Elimination of this advanced planning would require that all retailers have on-line access to the host database to allow the recipient to transfer funds on demand. However, this feature would require an on-line transaction to occur before the off-line transaction

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[1] This issue becomes more critical as EBT sites expand. Downloading hot card information to all retailers at which a participant might shop may not be cost-effective. Alternatively, hot card files could be downloaded to retailers in an area where a large percent of transactions occur, reducing the exposure.

[2] Stored value cards are expected to become available within the next 2-3 years, providing a replacement for cash, predominantly where transaction purchase amounts have a low dollar value. Experts have indicated that within a stored value card, account balances can be segregated and transaction processing can be restricted by retailer (i.e., FNS transactions could be restricted to FNS authorized food retailers only).

could be completed which would cause additional check-out time and additional telecommunications expense. The experts could identify no reason why the recipient would, in this scenario, use the option to transfer value to the chip.

Advantages

The single advantage cited by experts for this hybrid scenario is that it provides the maximum flexibility in retailer equipment. Retailers offering on-line POS applications, such as debit or credit card purchases, would already have magnetic stripe card readers. The benefit programs could be accessed by piggy-backing on the existing equipment. Where smart card readers exist, the program information could be accessed through the balance on the card. Retro-fitting equipment would not be an issue since this scenario allows the recipient to use the system which is available at the retailer.

Scenario 4: Off-line Security and On-line Transaction Processing

All program recipients would be issued benefit cards with an IC chip containing limited memory capacity. The recipient's identification and security information would be maintained on the IC chip embedded on the card, along with routing information to direct the transaction authorization to the processor. No magnetic stripe would be necessary. Benefit data would be maintained at a central database for on-line authorization and transaction processing. This scenario is considered a hybrid because of its use of both on-line and off-line processing. This discussion focuses on a single benefit program with benefits provided by one card. Multi-program delivery of benefits is not addressed within this discussion.

The EBT system functions as an on-line system, but draws on the security features of smart cards. Many of the experts considered this alternative to be the direction that the credit and debit card industry may pursue in order to reduce the incidence of fraud. In the current direct debit and credit systems, PINs are used when cash is obtained from an ATM

and the POS terminal; PINs are not used for credit card transactions where signatures serve as a form of identification.

Each recipient would be issued a card at the state or local agency. The recipient would select a PIN which would be encoded on the smart card, and verified at the retailer through the use of encryption techniques. In order to perform a transaction at a retailer, the recipient would present his or her card, insert it into the smart card reader, and enter his or her PIN. Once the POS terminal had verified that the correct PIN has been used, the terminal would read the chip and connect to the processor for authorization of the purchase amount. When the purchase was authorized by the processor, the central database would be updated to reflect the purchase. Using smart card technology for PIN validation would eliminate the need for host validation of the PIN and would therefore result in somewhat lower telecommunications costs. Currently, telecommunications costs may be incurred if an incorrect PIN is entered even if all other aspects of the transaction are correct. Manual transactions would be authorized based upon the value of benefits available in the recipient's host computer balance.

Drawbacks

According to our experts, the biggest drawback of this scenario is that in order to provide benefits in this scenario, all authorized retailers need to have POS devices able to read smart cards (although read/write capability is not necessary), as well as the ability to conduct on-line transactions. On-line transactions processed for debit and credit cards are based upon magnetic stripe cards, and the EBT system developed under this scenario would not be able to fully piggy-back on existing POS systems. However, since the chip in this scenario is used solely to authenticate the card and cardholder, the transaction could be completed via traditional on-line communications if the retailer was not equipped with a smart card reader. Therefore, to offset this drawback, it may be appropriate to issue benefit cards which contain both an IC chip and a magnetic stripe. The magnetic stripe could be used for out-of-state (or out of EBT region). This approach would, however, defeat the purpose of this scenario, i.e., increased security.

Advantages

The major advantage to this scenario is the authentication process available with the use of smart cards. This authentication ensures that the card is the original card since the chip contains a unique identifier which can be linked to the cardholder's PIN. Smart card manufacturers and system developers claim that this authentication process could virtually eliminate the possibility of fraudulent card counterfeiting in which the information on magnetic stripe cards is read and copied to a duplicate card. Card counterfeiting is a serious problem in the debit and credit card industries, but has not yet been a problem in EBT card systems.

Since this scenario is an on-line system transaction processing system, operating procedures for manual transactions, hot card files, and benefit issuance would not be altered from the existing on-line EBT systems. Some modification to the host-based software would be required to remove the authorization process. Dual authorization could remain (first at the card level and then when the transaction is processed by the host), but would be an unnecessary step and could result in an increase in the overall time it takes to complete a transaction. This would negate a side benefit of performing authorization at the POS device: reduced telecommunications costs as a result of a shorter transmission times and local PIN verification.[1]

If the commercial credit and/or debit card industries were to endorse chip card technology to reduce fraud and promulgate standards for chip card terminals and processing, then it would seem prudent for Program agencies to conduct a cost-benefit analysis to determine if the reduced potential for fraud warranted the increased costs of the technology.

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[1] It is reported in Hitachi, op. cit., that the use of IC cards in France has reduced communications costs because it is no longer necessary to perform on-line authorization.

Chapter 5

THE ECONOMICS OF A HYBRID SYSTEM

The economics of a hybrid system can be discussed in terms of design, development, implementation, and operations. The ultimate cost of *any* system will be largely dependent upon the scale of the system which includes variables such as the number of recipients, the number of terminals, and the number of cards. The examination of a hybrid system adds other design considerations that will have a significant impact on the final cost of the system.

This chapter presents, in general terms, key hybrid system design considerations and the impact that the decisions could have on the cost of the system. Included is a projection of the potential system costs associated with each of the four hybrid scenarios discussed in the previous chapters.

DESIGN CONSIDERATIONS AND THEIR IMPACT ON COST

When designing a hybrid system, many of the considerations are extensions of design choices familiar to either an on-line or off-line system. In these cases, a design issue includes the number of terminals to be deployed. The hybrid design requires determining how many of each type of terminal (dual card capability, basic terminal - magnetic stripe, or enhanced, etc.) should be deployed.

A discussion of some of these design considerations and how each impacts costs is presented below.

- If all retailers were equipped to process both off-line and on-line transactions, then each retailer would require a communications line specifically to transfer the on-line data. This same line could be used to transport off-line data in batch mode. However, retailers equipped only to accept off-line transactions may not require the installation of a separate communications line and could use an existing phone line to send the off-line end-of-day settlement transactions to the host.

- If all recipients were expected to be able to access benefits in either an on-line or off-line mode, then each recipient would require a card containing

both a magnetic stripe and an IC chip. A less expensive alternative would be to issue IC chip cards only to those recipients expected to utilize the off-line system. In Chapter 4, various implementation scenarios were presented. In one scenario, certain geographic areas would be equipped with an on-line system, while other areas would be equipped with an off-line system. It is conceivable that only those recipients in the off-line area would be issued smart cards. However, this approach would limit the ability of this group of recipients to shop in the on-line areas. In another scenario, recipients participating in the Food Stamp Program would be issued smart cards while those participating in a cash program would be issued magnetic stripe cards. Recipients participating in both programs would be issued a dual purpose card. The cost of adding a magnetic stripe to a smart card is small ($0.10 or less); the cost of adding a chip to a magnetic stripe card is significant (approximately $5.00). Therefore, it would not be cost effective to issue participants receiving only cash benefits a card that contains an IC chip as well as a magnetic stripe since the IC chip would not be used.

- An integrated off-line/on-line host system might be able to share some equipment and some functionality. For example, both on-line and off-line systems require a "back-end" batch process to update recipient and retailer accounts, produce the transaction records for retailer credit, and produce reports. These functions could be shared across both systems. Some administrative functions such as training and customer service could also be shared. Similarly, many of the on-line systems and the off-line system in Dayton, Ohio, utilize similar host computers. While the existing host computers may not be sufficient in terms of functionality or capacity to accommodate both systems, enhancement of these existing devices may be more economical than purchase and operation of separate units for each system.

- The type of smart card utilized in the system will directly impact costs. The broad definition of smart cards includes many different cards with varying memory capacity and processing capabilities. These cards range from simple memory cards used to store and transport data, to sophisticated computer chip cards with internal operating systems, expanded memory and built-in software. Cards at the low end of the range could cost as little as $1.00 each while cards at the upper end could cost $10.00 or more a piece. Currently, cards are generally discussed in terms of the following three categories:

  - Simple memory cards. These cards contain a simple EEPROM (electronically erasable programmable read only memory) serial memory chip ranging from 2k bits up to 4k bits. They provide no security at the card level and are used primarily as portable data files.

  - Protected (personalized) memory cards. These cards contain an integrated processor and EEPROM memory chip ranging from 416 bits to 896 bits. They will accommodate PIN and password protection and

have a unique internal serial number. They are generally used in pre-paid, electronic purse (stored value), and security applications.

- Microprocessor (computer) cards. These cards are the most sophisticated cards, containing processing and memory capability. The EEPROM memory ranges from 16k bits up to 64k bits. The card can provide high security including internal encryption/decryption and key management. This is the type of card used in the Dayton off-line EBT demonstration.

The memory and processing capabilities of cards continue to increase even while costs decrease. It is likely that, in the future, buyers of smart cards will be able to either obtain cards at lower cost or obtain cards with enhanced capability at the current cost. In addition, at quantities over 1 million cards, the per card costs are significantly reduced. Estimates provided by vendors are speculative, but indicate that a 40 percent reduction in cost could be expected. The relationship between cost, volume, and card type is illustrated in Figure 5.

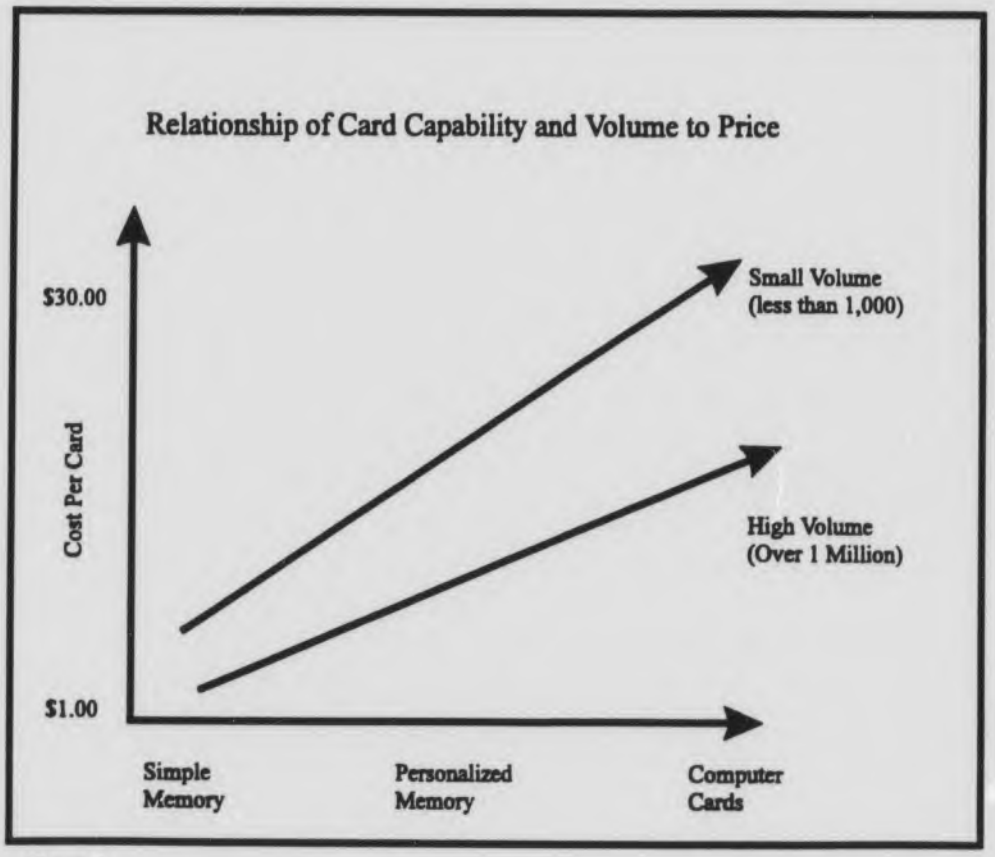

Figure 5

Design, Development and Implementation Costs

Little direct information is available on the costs to design, develop and implement a hybrid system. However, estimates of these costs can be imputed based upon the actual costs to design, develop and implement an on-line system and similar costs for an off-line system.

System Design and Development Costs

The cost to design and develop the Dayton off-line system were approximately $2.3 million.[1] Adjusting these costs to include unbilled overtime costs results in costs of approximately $2.47 million. Similar costs for on-line systems are as follows:

- Reading, PA - $1.78 million (adjusted to 1992 dollars) for the original system (not including Phase C enhancements).[2]
- New Mexico - $919,318 (adjusted to 1992 dollars), of which $546,994 is attributed to FSP.[3]
- Minnesota - Approximately $1.39 million, of which $1.17 million is attributed to FSP.[4]

Cost Estimate for FSP-only System in New Mexico and Minnesota. The design and development costs for Minnesota did not include the costs for the original cash-only EBT system. By estimating that the FSP costs in Minnesota would represent the same percentage of total costs as the New Mexico program (i.e., approximately 59%), Minnesota cash program costs (in 1992 dollars) were increased to $799,731. To estimate the cost to design

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[1] Gary L. Glickman, et al., *The Impacts of the Off-line EBT Demonstration on the Food Stamp Program*, Phoenix Planning & Evaluation, Ltd., Rockville, MD, April, 1994.

[2] John A. Kirlin, et al., *The Impacts of the State-Operated Electronic Benefit Transfer System in Reading, Pennsylvania*, Abt Associates Inc., Cambridge, MA, February, 1990.

[3] John A. Kirlin, et al., *The Impacts of the State-Initiated EBT Demonstrations on the Food Stamp Program*, Abt Associates Inc., Cambridge, MA, June, 1993.

[4] Ibid.

and develop a FSP-only system for New Mexico and Minnesota, it was assumed that 20 percent of the total cash program costs were fixed system costs. Under this assumption, the cost of a stand-alone FSP system was approximately $621,500 in New Mexico and $1.33 million in Minnesota. The average on-line, FSP-only system costs for the two locations is $975,750.

Normalizing the Off-line System Costs. The average on-line EBT system costs as shown above were approximately $975,750. The original Reading system costs were $1.78 million or 1.82 times higher than the two subsequent on-line demonstration systems. While not necessarily indicative of what would happen with costs of off-line systems, it can be speculated that a percentage of the higher costs in Reading was due to the system being the first experimental project of its kind. It is reasonable to assume that a similar percentage of the Dayton system costs are due to that system being the first experimental project of its kind. Using the percentage from the Reading project, the design and development cost of the next off-line EBT system would be approximately $1.36 million.

Implementation Costs

For the purpose of this analysis, implementation costs include store set-up costs and initial training for retailers and recipients. Implementation costs are highly affected by the number of participating recipients and retailers. Because the characteristics of the recipient population and retailer base in the four food stamp EBT project areas (Dayton, Reading, New Mexico, and Minnesota) vary, as well as the circumstances surrounding each implementation (e.g., Minnesota FSP recipients required far less training than those in other locations because many had already participated in the earlier AFDC EBT system), it is difficult to draw any conclusions based upon the implementation costs for these sites. However, data on the costs of retailer POS implementation and retailer and recipient training can be used as a proxy to develop implementation cost estimates for a hybrid system. Implementation costs (in 1992 dollars) for the four demonstrations are provided in Exhibit 2.

Exhibit 2

DEMONSTRATION SITE IMPLEMENTATION COSTS

Demonstration Site	Total Implementation Costs
Dayton, Ohio	$1.11 million
Reading, Pennsylvania	$900,000
New Mexico	$660,346
Minnesota	$686,936

Store Set-up Costs. Store set-up costs include those costs incurred to install and wire POS terminals, telecommunication lines, and other field equipment necessary to support POS transaction processing at the retail location.[1] Installation charges for a POS terminal should be the same for both on-line and off-line terminals. The average installation cost for grocery stores, convenience stores, and consumer goods and other stores are estimated at $300 per lane.[2]

Training Costs. Retailer training costs are estimated at $60 per lane for on-line transaction processing based upon typical costs in a commercial POS system.[3] Retailer training for on-line or off-line processing in a mature system should be similar. Recipient training in the Dayton demonstration totaled approximately $210,500 for 11,000 recipients or $19.14 per recipient. It is assumed that recipient training in a mature on-line or off-line system is comparable. State training costs depend upon the state's involvement in the EBT

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[1] Terminal costs are not included in the implementation costs of an EBT system but are amortized and included in the per case month operating costs of the system.

[2] Gary L. Glickman, et al., *The Business Case for Retail POS*, Electronic Funds Transfer Association, Herndon, VA, December, 1992.

[3] Ibid.

system. Because each demonstration project has been implemented and managed differently, a general cost estimate of state training is not available. Therefore, state training costs are excluded from our implementation cost estimates.

Operating Costs

Based on data provided in *The Impacts of the State-Initiated EBT Demonstrations on the Food Stamp Program* and *The Impacts of the Off-line EBT Demonstration on the Food Stamp Program*, the probable cost of operating either system, assuming a population of approximately 20,000 recipients, is $3.73 per case month for an on-line system and $4.30 per case month for an off-line system. Where necessary, adjustments to these per case month costs for terminal and card costs were made using the information provided below.

Terminal Costs

The cost of terminals vary by EBT system:

- On-line EBT system. Our research found that 80 percent of all deployed on-line terminals fall into the "basic terminal" category ranging in cost from $250 to $300. The rest of the on-line terminals fall into the "enhanced terminal" category, ranging from $500 to $700. The average cost of an on-line terminal is approximately $340. Small stores with low transaction volume tend to purchase the less expensive terminals, while larger stores with higher volumes and more sophisticated systems tend to purchase the enhanced terminals.

- Off-line EBT system. The average cost of an off-line EBT terminal is approximately $860. This figure was derived from the average cost to modify an "enhanced terminal" ($825; estimates ranged from $700 to $950) and the average cost of an "integrated terminal" (approximately $900).

Card Costs

The cost of a magnetic stripe card including embossing, printing and personalization is estimated at $0.80 per card. The cost of a smart card capable of meeting the needs of an off-line system is estimated at $5.00 per card.

Telecommunications Costs

While there are a number of additional cost elements which comprise the total operating costs of an EBT system, telecommunications costs appear the most misunderstood. The telecommunications requirements of an on-line and off-line EBT system differ only in the frequency with which data must be exchanged between a POS terminal and the EBT host computer; the hardware and software requirements for this data exchange remains constant for both systems. As previously mentioned, both dedicated and dial-up telecommunications lines can accommodate on-line and off-line transaction processing. Described below are some of the criteria for determining the most cost effective telecommunications environment for a retail store.

The ongoing telecommunications cost for either an on-line or off-line EBT system is determined by the number and type of telecommunications lines deployed at a retail store to support EBT transaction processing. Several variables, such as the number of check-out lanes equipped with POS terminals, the POS transaction volume, and the ongoing costs for the lines, must be considered in order to determine the most cost effective configuration for a retail store.

At a minimum, each store will require one telephone line. In some situations, especially in supporting off-line EBT applications, the same line used by the store for normal telephone service may be used.[1] In multi-lane stores, one line may suffice through

[1] In an off-line EBT environment, the retailer may choose how frequently data will be transmitted between the store and the EBT host computer, usually with a minimum of one data transmission per 24 hour period which may take place in the off hours when the

the use of an in-store controller. A controller acts as a central traffic director allowing multiple POS terminals to share one telecommunications line. Depending on the number of terminals, there may be instances when a multi-lane store would install more than one controller (and line), e.g., the number of POS terminals in the store exceeds the capacity of one controller.

Another consideration for EBT applications is whether to use dial-up or dedicated telecommunications lines.[1] Dial-up lines are usually sufficient for off-line and most on-line EBT applications. However, high volume retailers in an on-line EBT environment may choose to use dedicated lines, which offer faster transaction throughput. The periodic uploading and downloading that occurs in off-line EBT transaction processing does not usually require a dedicated line even though more information is being transmitted at one time than in an on-line EBT transaction processing environment.[2]

SUMMARY OF THE ECONOMICS OF A HYBRID SYSTEM

While it is not clear that a hybrid system would incur the cumulative costs of both an on-line and an off-line system, it is apparent that the cost of a hybrid system would exceed the cost of either an on-line or off-line system. For example, additional training would need to take place to train recipients, retailers and state personnel in the use of both technologies. Similarly, each system would require development of separate "front-end" host

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telephone line should not be in use. In an on-line EBT environment, a connection with the EBT host is required for each EBT transaction processed by a retailer and sharing an existing telephone line may prove difficult to coordinate.

[1] Business dial-up lines have a fixed monthly fee ranging between $25 and $50 per month, usually with an additional nominal fee for each transmission (e.g., $0.10 per call). Dedicated lines have a fixed monthly fee that can range from $100 to $6,000 depending upon the capacity of the line (line speed), distance covered, and the telecommunications provider; with no additional charge per transmission.

[2] These downloads and uploads of data, commonly referred to as batch transmissions, generally include all POS transactions conducted at the store (which are uploaded to the host computer) and all new information on the host computer (which are downloaded to the store), e.g., negative files and issuance records.

software to acquire, authorize and manage recipient and retailer transactions. Customer service personnel would need to be conversant in the technical aspects of both systems and would need terminal access to both systems.

Using the financial information discussed above, we have extrapolated an estimated cost for each of the hybrid scenarios discussed in the previous section. These estimates are summarized in Exhibit 3. It should be noted that point estimates of the costs of each scenario are used rather than ranges to provide a reference for measuring the relative costs of each system as an aid to decision makers considering the development of a hybrid EBT solution. The actual cost to develop, implement, and operate any hybrid EBT system will be dependent upon the numerous factors discussed within the body of this report. In the appendices, we have provided a full description of each assumption and calculation to facilitate the reader's understanding of each estimate.

Exhibit 3

SUMMARY OF ESTIMATED COSTS OF HYBRID SCENARIOS

Scenarios	Design and Development Costs	Implementation Costs	Total	Monthly Operating Costs	Per Case Month Cost
1	$2,258,750	$565,650	$2,824,400	$111,200	$5.56
2	$2,067,000	$568,800	$2,635,800	$85,300	$4.27
3	$1,674,812	$562,800	$2,237,612	$102,360	$5.12
4	$1,043,750	$562,800	$1,606,550	$80,600	$4.03

Appendix A

SCENARIO 1

ON-LINE OR OFF-LINE EBT BASED UPON GEOGRAPHIC AREA

Exhibit A-1

SUMMARY OF COSTS

Cost Category	Cost
Design and Development	$2,258,750
Implementation	565,650
Total	**$2,824,300**
Operating Costs	$111,200

The following assumptions were used in determining the costs:

- Two processors
- <u>Total system area:</u>

  Recipient population = 20,000
  Retail base = 200 stores
  Total lanes equipped = 500

  "On-line Only" area:
  Recipient population = 10,000
  Retail base = 70 stores
  Total lanes equipped = 175

  "Off-line Only" area:
  Recipient population = 10,000
  Retail base = 70 stores
  Total lanes equipped = 175

"Border" area:

Recipient population	=	N/A
Retail base	=	60 stores
Total lanes equipped	=	150

Design and Development Costs

On-line system	$975,750
Off-line system	1,360,000
Total	**$2,335,750**
Cost of the state interface [a] (included in each system above)	-77,000
Net cost	**$2,258,750**

Implementation Costs

Store set-up ($300 per lane times 500 lanes)	$150,000
Retailer training [b]	
On-line stores	11,025
Off-line stores	11,025
Border stores	10,800
Subtotal	**32,850**
Recipient training [c]	382,800
Total	**$565,650**

[a] Scenario assumed that common file formats would be accepted by both processors.

[b] Each system would incur higher training costs due to the manual processing requirements. Retailers in the on-line and off-line areas would require training on the appropriate transaction processing as well as the manual processing procedures for the card used in the other system. It was estimated that this additional training requirement would increase training costs by less than five percent (5%). Therefore, retailer training costs were $63 ($60 * 1.05) per lane at on-line and off-line system areas. Border store training costs are expected to be twenty percent (20%) higher; yielding costs of $72 per lane ($60 * 1.20) for each of the 150 border store lanes.

[c] Recipient training costs should not be impacted by the different systems. Each recipient will be issued one card, and will receive training on that card. Training costs are estimated to be $19.14 per recipient, or $382,800 ($19.14 * 20,000) in total.

Operating Costs

It is not expected that the number of transactions performed per recipient will differ based upon the type of EBT system in place. The operating costs on a per case month basis are expected to exceed those reported in Chapter 5 ($4.30 for off-line, $3.73 for on-line) since fixed costs are spread over a smaller base of recipients (each system handles 10,000 recipients instead of one system handling 20,000). In addition, $0.06 was added to the average per case month cost to reflect the disproportionate number of dual purpose terminals necessary to equip the border stores.

Off-line system ([$5.89 [d] + 0.06] * 10,000)	$59,500
On-line system ([$5.11 [e] + 0.06] * 10,000)	51,700
Total	**$111,200**

[d] Average of the low and high estimates for expanded Montgomery County provided in Volume I, Chapter 5 of *The Impacts of the Off-line EBT Demonstration on the Food Stamp Program*, Exhibit 5-3, page 159.

[e] Imputed for a reduced recipient population based upon the ratio of increased costs in the off-line per case month calculation.

Appendix B

SCENARIO 2

ONE BENEFIT PROGRAM ON-LINE AND ONE BENEFIT PROGRAM OFF-LINE

Exhibit B-1

SUMMARY OF COSTS

Cost Category	Cost
Design and Development	$2,067,000
Implementation	568,800
Total	**$2,635,800**
Operating Costs	$ 85,300

The following assumptions were used in determining the costs:

- Single processor for both systems
- Total system area:

Recipient population	=	20,000
On-line Only	=	4,000
Off-line Only	=	4,000
On- and Off-line	=	12,000
Retail base	=	200 stores
Total lanes equipped	=	500

- All retailers have both on-line and off-line capabilities
- All cards have both a computer chip and a magnetic stripe

Design and Development Costs

On-line system	$975,750
Off-line system	1,360,000
Total	**$2,335,750**
Cost of the state interface [a] (included in each system above)	-77,000
Overhead and savings gained due to operating efficiencies	-191,750
Net cost	**$2,067,000**

Implementation Costs

Store set-up ($300 per lane)	$150,000
Retailer training [b]	36,000
Recipient training [c]	382,800
Total	**$568,800**

[a] Scenario assumed that an integrated eligibility system was in place.

[b] Retailer training includes both on-line and off-line processing. This should increase the retailer training cost by approximately 20 percent, from $60 per lane to $72 per lane.

[c] Recipient training costs should not be impacted by the two systems. Each recipient will be issued one card, and will receive training on that card. Training costs are estimated to be $19.14 per recipient, or $382,800 ($19.14 * 20,000) in total.

Operating Costs

The case per month cost was derived assuming an equal number of on-line and off-line recipients and transactions. $0.50 was added to the on-line per case month cost to account for the smart card capability on all cards. The average per case month cost is $4.27.

On-line system ([$3.73 + 0.50] * 10,000)	$42,300
Off-line system ($4.30 * 10,000)	43,000
Total	**$85,300**

Appendix C

SCENARIO 3

ONE BENEFIT PROGRAM ACCESSED VIA ON-LINE AND OFF-LINE TECHNOLOGY

Exhibit C-1

SUMMARY OF COSTS

Cost Category	Cost
Design and Development	$1,674,812
Implementation	562,800
Total	**$2,237,612**
Operating Costs	$102,360

The following assumptions were used in determining the costs:

- Single processor for both systems
- Total system area:

Recipient population	=	20,000
Retail base	=	200 stores
Total lanes equipped	=	500
On-line Retailers	=	100
Total lanes	=	250
Off-line Retailers	=	100
Total lanes	=	250

Design and Development Costs

On-line system	$975,750
Off-line system	1,360,000
Total	**$2,335,750**
Cost of the state interface (included in each system above)	-77,000
Cost of a central processing center (included in each system above) ($2,258,500 * 0.25)	-583,938
Net cost	**$1,674,812**

Implementation Costs

Store set-up ($300 per lane)	$150,000
Retailer training [a]	30,000
Recipient training [b]	382,800
Total	**$562,800**

[a] Retailer training costs are approximately $60 per lane. No additional training requirements are necessary. Retailers will be trained to process only one type of transaction (on-line or off-line).

[b] Recipient training costs should not be impacted by the two systems. Each recipient will be issued one card, and will receive training on that card. Training costs are estimated to be $19.14 per recipient, or $382,800 ($19.14 * 20,000) in total.

Operating Costs

The case per month cost was derived assuming an equal number of on-line and off-line transactions. The smart card capability on all cards was accounted for by adding $0.50 to the per case month cost of on-line systems. The per case month costs were increased by 20 percent to cover the increased reconciliation burden. No adjustment was made for terminal costs because it was assumed that the distribution of terminals between on-line and off-line would be 250 each. The result is an average per case month cost of approximately $5.12.

On-line system ([$3.73 + 0.50] * 10,000)	$42,300
Off-line system ($4.30 * 10,000)	43,000
Subtotal	**$85,300**
Plus 20 percent	$17,060
Total	**$102,360**

Appendix D

SCENARIO 4

OFF-LINE SECURITY AND ON-LINE TRANSACTION PROCESSING

Exhibit D-1

SUMMARY OF COSTS

Cost Category	Cost
Design and Development	$1,043,750
Implementation	562,800
Total	**$1,606,550**
Operating Costs	$80,600

The following assumptions were used in determining the costs:

- Single processor for both systems
- Total system area:

Recipient population	=	20,000
Retail base	=	200 stores
Total lanes equipped	=	500

Design and Development Costs

On-line system	$975,750
Cost of the smart card software (5% of off-line design and development costs)	+68,000
Total	**$1,043,750**

Implementation Costs

Store set-up ($300 per lane)	$150,000
Retailer training [a]	30,000
Recipient training [b]	382,800
Total	**$562,800**

[a] Retailer training costs are approximately $60 per lane. No additional training requirements are necessary.

[b] Recipient training costs should not differ from those in on-line or off-line EBT demonstrations. Training costs are estimated to be $19.14 per recipient, or $382,800 ($19.14 * 20,000) in total.

Operating Costs

The per case month cost should be similar to other on-line EBT systems since all transactions are processed on-line. An additional $0.30 per case month was added to accommodate amortization of the smart card.

On-line system ([$3.73 + 0.30] * 20,000)	$80,600
Total	**$80,600**