

Canadian Debit and Prepaid Technology

A Management Perspective

White Paper

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Introduction: Card Payment Trends & Growth

The card payment industry is undergoing tremendous growth in the debit card and prepaid card segment. The trends are hard to ignore:

- In 2003 Visa International reported that over \$1.48 trillion was spent on debit cards, outperforming credit cards for the first time.
- Global prepaid phone card spending is expected to grow to over \$240 billion by 2010.
- Annual gift card spending, in the USA, grew by 21% to over \$45 billion between 2003 and 2004.

Consumers and merchants are driving this change. Consumers want the convenience; merchants want the extra sales and lower-cost transactions. This win-win combination is driving a transformation of the card payment industry as we know it today.

Like any industry reformation there are threats, opportunities, and confusion. Bankers and merchants alike are asking themselves how these new card payment options could add value to (or lower the cost of) running their business.

Strategic Information Technology (SIT) Limited has implemented over 130 card payment applications to date including retail banking debit cards, prepaid ATM cards, loyalty-based debit cards, international debit cards, and more.

Card Payment Technology: An Approach to Learning

The technology surrounding the card payment industry is complex. It requires sophisticated cryptography, communications and databases to make it all work. Our objective in this paper, is to educate the manager – not the technician. Therefore, we'll explore the technology used for card payment applications at an operational level only.

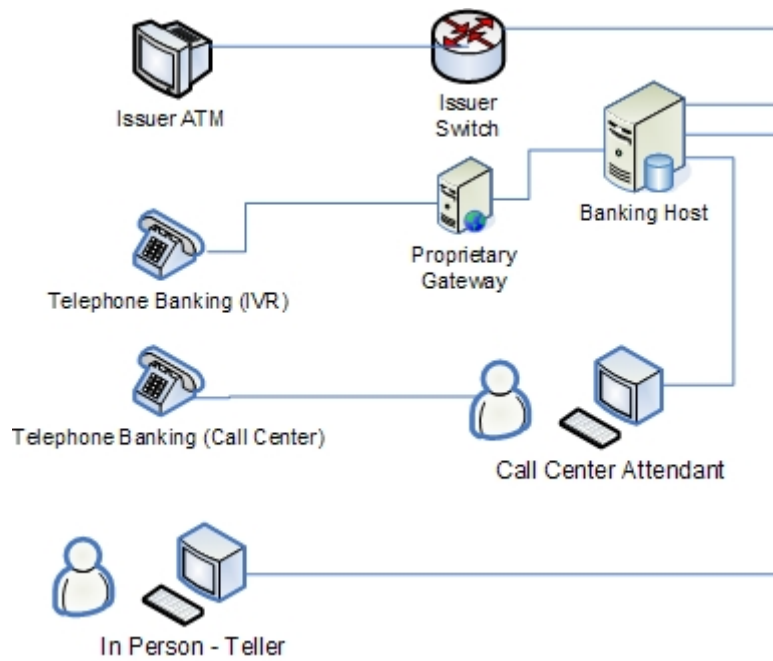
Strategic Information Technology (SIT) believes managers should build a foundation of card payment knowledge before they invest in any card payment technology. Our approach to facilitate this knowledge is simple. We'll start at the beginning when debit cards were first introduced in Canada, and move forward to present-day. We'll also include web banking in this overview because it is such a relevant complement to card payment technologies overall.

Canadian Retail Banking: A Bit of History

Prior to the formation of Interac in 1986, Canadians could do their banking in person, on the telephone (using a call centre), or at their financial institution's ATM using a PIN-enabled bank card. Most major financial institutions in Canada had an ATM solution that allowed customers to withdraw money, deposit cheques, perform account transfers, and make balance inquiries. The term "debit" was not used, as consumers were simply issued a "bank card" by their financial institution and chose a Personal Identification Number (PIN) to enable this bank card.

With the exception of limited inter-bank transactions allowed by the Cirrus or Plus networks, consumers could only perform banking activities at an ATM provided by their own financial institution.

The diagram below represents the types of interactions available to banking customers before Interac was formed.



Canadian Retail Banking Circa 1986

Interac's First Success: Shared Cash Dispensing

Interac was formed in 1984 and by the end of 1986 had grown to 10 members; 1986 also marked the year that Interac pioneered shared cash dispensing (SCD). SCD was the platform that enabled customers to withdraw funds from either their chequing or savings accounts on **any** Interac-enabled ATM as long as their accounts were held with an institution that belonged to Interac. When consumers used a third party ATM they could not deposit funds or perform account transfers, but they didn't seem to mind as they no longer had to travel far to access an ATM to withdraw cash.

Interac's Second Success: Interac Direct Payment

Interac, fresh on the heels of its success with SCD, pioneered yet another new concept. In 1990 Interac Direct Payment (IDP) was tested in two regions in Canada with various retailers. IDP enabled consumers who banked at a financial institution that was a member of Interac to use their PIN-enabled bank cards to purchase goods and services from a merchant. The trial was a tremendous success and by the mid-1990's Interac Direct Payment had been deployed across Canada.

Interac Inter-Member Network

From a technology point of view, the network architecture that enables Shared Cash Dispensing and Interac Direct Payment is much like the internet itself, in that any single computer host or communications device can fail without affecting any of the other members of the network. The network that enables Interac is referred to as the Inter-Member Network and is operated by the individual members of Interac.

Interac as a group, determines the regulations and policies required to allow connectivity to this network. Interac is also subject to (and operates within) the regulatory framework of the Canadian Payments Association.

Debit Card Industry Terminology

Bank Information Number

If you examine a debit card you'll see raised or printed numbers on the face of the card. The first four to six digits on that number are referred to as the Bank Information Number (BIN). The BIN is also embedded within the magnetic stripe on the back of the card. The BIN is the key information that enables the Inter-Member Network to route debit transactions.

The Acquirer and Issuer

Within the payments industry, the terms **acquirer** and **issuer** are often used to help differentiate who receives the transaction from who settles the transaction.

The merchant or ATM that swipes the card is referred to as the acquirer. The financial institution that honors the transaction is referred to as the

issuer. If you purchase a DVD player at Big Box Audio and pay for it with your Friendly Bank debit card, it can be said that Big Box Audio is the acquirer and Friendly Bank is the issuer.

Switch or ATM Switch

Within the payments industry the term “switch” or “ATM switch” is used to describe the highly secure device that routes and/or terminates a debit transaction.

It is important to differentiate a switch from an ATM. Each switch may work with dozens or thousands of ATM or Point of Sale devices.

To help illustrate how a switch works, we'll step through a typical debit transaction.

Example:

Purchasing a DVD player at Big Box Audio with a Friendly Bank debit card.

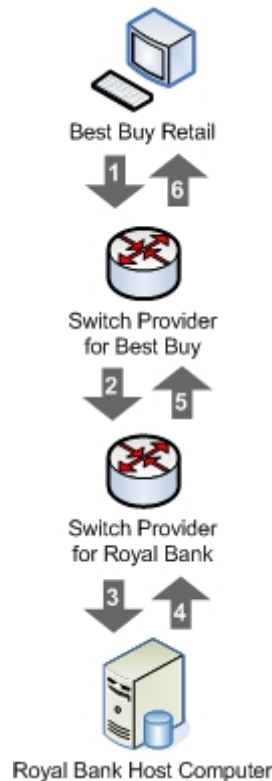
1. User swipes card and enters PIN at the point of sale device.
2. The request is encrypted and then goes to the acquirer switch provider (that Big Box Audio uses).
3. The acquirer switch examines the BIN and routes the transaction to Friendly Bank's switch (the issuing switch).
4. The issuing switch verifies that the PIN is correct and accesses Friendly Bank's host computer to determine if there is enough money in the account for the debit transaction.
5. The issuing switch then sends notification back to the acquirer switch indicating whether or not the transaction was successful.
6. The acquiring switch then notifies the point of sale device at Big Box Audio whether or not the transaction was successful.

Illustrated: A Typical Debit Point of Sale Transaction

1/ Consumer at Big Box Audio, swipes card and enters PIN for debit transaction. Transaction travels to Big Box Audio switch provider, which examines BIN and determines that transaction should be routed to the Friendly Bank switch.

2/ Friendly Bank switch verifies PIN and then communicates with Friendly Bank host computer where retail banking accounts are held.

3/ Banking host determines if there are enough funds in the retail banking account for transaction and performs transaction.

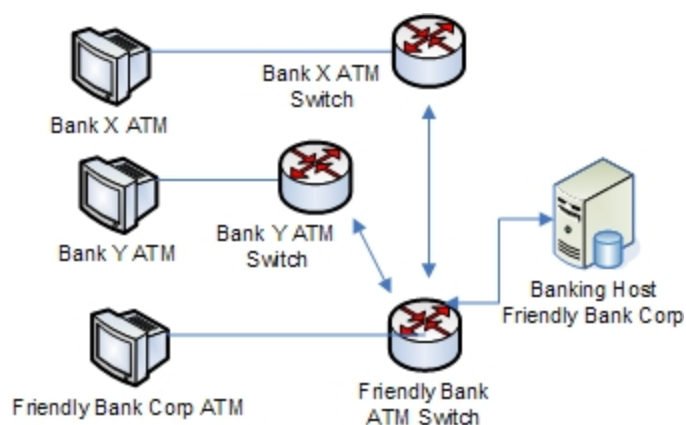


6/ Consumer, and merchant are notified of the status of transaction on point of sale terminal.

5/ Big Box Audio switch provider receives notification from Friendly Bank switch and then notifies retail point of sale system with the status.

4/ Friendly Bank host communicates status of transaction back to Friendly Bank switch.

Illustrated: Interac Shared Cash Dispensing Workflow (ATM)



By belonging to the Interac network, Friendly Bank assures its clients access to their accounts via every other Interac Inter-Member ATM (i.e. Bank X and Bank Y).

Interac: Not Everything Turns to Gold

While it may seem that everything Interac has pioneered has become successful, this is not the case. Interac Online, as one example, has not been successful. Interac Online was designed to allow consumers to pay for goods and services online by directly debiting their bank accounts, much like consumers do at a retail merchant. Most notably, Interac Online is a great example of how the success or failure of a payment program is not necessarily a function of the technology. Marketing, branding, and the overall value proposition are more important. Interac Money Transfer is another program launched by Interac that has been successful from a technological perspective, but has proven to have limited demand compared to Shared Cash Dispensing and Interac Direct Payment programs.

Why Debit Cards were Successful in Canada

You'll find little argument that the success and rapid deployment of debit cards in Canada is due primarily to the vision of Interac. It was also a matter of financial leverage. Six of the largest Canadian banks hold 90% of the banking assets in Canada. By comparison, the eight largest banks in the USA hold approximately 40% of the assets. As such, when there was agreement among the larger Canadian banks to endorse a new payment method or technology, the speed of deployment was swift, and on a national scale. Lastly, the value proposition was impossible to resist for retailers. (The only competing card payment method, credit cards, skimmed a percentage of each transaction while debit cards had a fixed fee – typically 9 cents to 35 cents per transaction).

Debit: Canada versus USA

As of 2003, Canadians were the highest per-capita users of debit cards in the world, averaging 82 debit card transactions per person. The United States, by comparison, averaged 63 debit card transactions per person. Victor Lubasi, senior analyst for the Chicago Federal Reserve, believes the difference is primarily due to the dominance of fewer (larger) banks in Canada, versus that of regionally focused (and regulated) banks in the USA.

PIN-Based Debit (On-Line) Routes in Real Time

Unlike most credit card transactions, most debit card transactions take place in real time at the moment the user performs the transaction. The acquiring switch determines, via the Bank Information Number (BIN), to which issuing switch the transaction should be routed. Once it arrives at the issuer's switch the PIN is verified against a key-encrypted result that is stored on the issuing switch (i.e. a PIN is never stored in an unencrypted or un-keyed format on any device). The point of sale device (or ATM device) will time-out if the transaction is not completed within approximately 16 seconds. The switch then communicates with a host computer to determine whether there are sufficient funds in the account. If there are sufficient funds, the transaction is performed in real time (i.e. the account is debited immediately). If for some reason the host computer can't be reached, the switch can perform a **stand-in** transaction (the amounts and limits of these stand-in transactions are configured by the issuer).

Off-Line (in the USA)

Most Americans have the option of using off-line (signature) debit or on-line (PIN-based) debit. The key difference, from a business perspective, is that the off-line debit transactions are managed by major credit card companies in conjunction with a bank. Most American retailers prefer the on-line PIN-based debit because there are lower fees associated with these transactions. To date, there has been little influx of off-line debit in Canada. Off-line debit, as the name implies, does not happen in real-time and transactions are batched to occur at a later date.

Debit Card Security

ATM's and switches contain secure crypto-processors, a technology which is beyond the scope of this paper. Each device in the ATM and switch network contains one or more secret key values which are used to encrypt sensitive data at each point in the network. Without exploring the merits of this cryptographic method, it is important to note that virtually all debit card fraud is associated with "card skimming" and "double swiping" in combination with "PIN-recording". Card skimming is a technique whereby

criminals can put a false-front to an ATM machine so they can duplicate the magnetic stripe. “Double swiping is a technique whereby a merchant employee swipes a card on another device in addition to the regular point-of-sale device. PIN-recording is when criminals record (using a camera) what users key in for their PINs. If the magnetic stripe can be duplicated and then matched up with the correct PIN, a criminal can quickly gain access to the consumer’s bank accounts.

It is important to note that Interac, along with other international payment associations, will be implementing more secure debit cards that are chip-based (so-called “smart card” technology). Since these changes are mostly hardware and switch related, retail banking software applications like Portfolio Plus will require no changes.

Debit Card Innovation: Branding and Co-Branding

Only certain financial institutions in Canada are allowed to have a BIN. In Canada, it is possible to allow a company to brand their image on a debit card that is not. As an example, a payday loan company could appear to provide a debit card by entering into an agreement with an existing financial institution so the payday loan company’s brand identifier could appear on the front of the card. Legally, however, the agreement and settlement for this debit card would be between the consumer and the financial institution (typically noted on the back of the debit card). Financial institutions are lending their BIN’s to companies that do not have the regulatory authority to issue debit cards themselves. As an example, within Canada, if you want to obtain a Titanium debit card from Money Mart, this debit card actually uses the BIN from PACE Savings and Credit Union. When a Titanium debit card from Money Mart is used at Big Box Audio, the transaction is sent to Big Box Audio’s switch provider which then routes the transaction to the issuing switch as determined by the BIN (in this case Pace Savings and Credit Union). The issuing switch examines the full card number and determines that the card is indeed a card issued by PACE but also determines, via the account number, that this transaction is not a regular PACE Savings and Credit Union customer. The debit transaction is then routed to a separate host database (the one that houses the Money Mart debit card customers).

Use of the Personal Account Number (PAN)

Within the payment industry the acronym PAN (Personal Account Number) is used to refer to the unique number of every debit or credit card. The BIN is considered part of the PAN. To accommodate multiple applications, financial institutions will segment their PAN's so transactions can be further routed. For example, using a combination of the BIN and a partial PAN, an issuer switch can determine whether a particular debit transaction is destined for their "regular" customers (e.g. those with chequing and savings accounts) or an application for which they've loaned out their BIN (perhaps a 3rd party debit card).

Debit Card Updates and the Card Authorization File (CAF)

The issuer is responsible for managing updates to the switch provider. Updates such as daily limits, new users, and deleted cards must be maintained. Portfolio Plus allows issuers to update the CAF on the switch, in real-time.

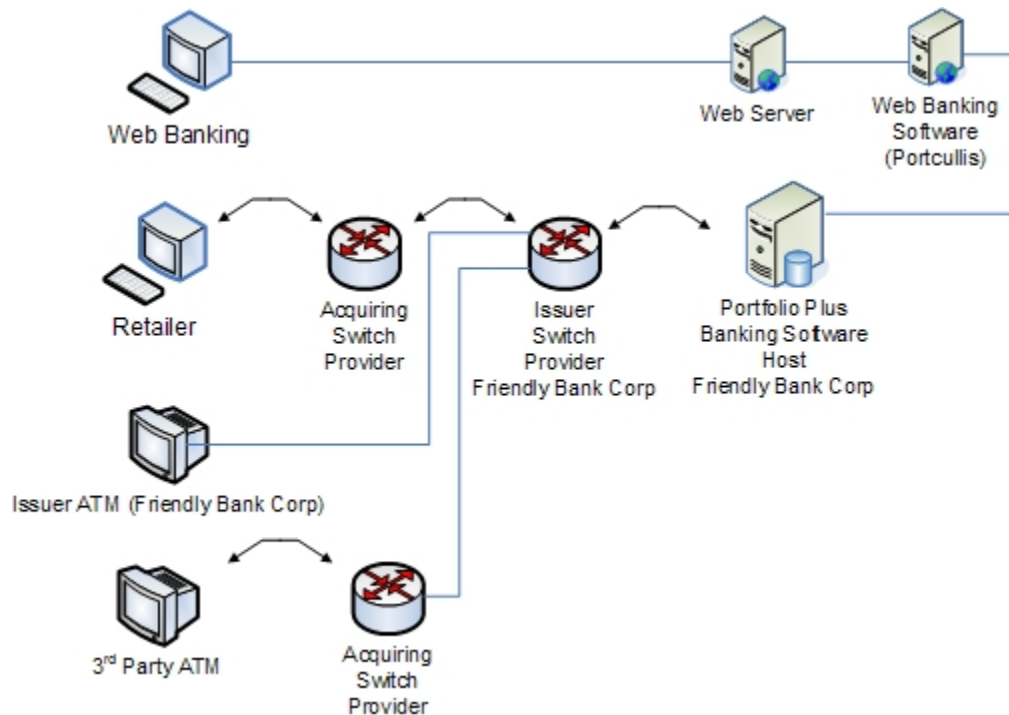
Prepaid Debit versus Regular Debit

Technically, there is little or no difference between prepaid debit and regular debit. The use of the phrase "prepaid debit" is simply a vernacular idiom. That is, a debit card is typically meant to refer to somebody's chequing or savings account, while a prepaid debit card is usually meant to refer to something other than a regular chequing or savings account. As an example, you can walk into Money Mart and obtain a Titanium debit card and load it with a value (let's say \$100). Many in the industry will refer to this type of card as a prepaid debit card. Technically speaking, what you've done is created an account that acts very much like a chequing account with no overdraft. You still have to present identification to open this account, and there is still a legal agreement that you'll have to sign. Same goes for payroll cards, government benefit cards, or so-called fleet-cards (e.g. those used by truckers).

Debit Cards and Web Banking

Technically speaking, debit cards are not dependent on web banking. However, the use of web banking in conjunction with debit transactions is so common that we will explore it here.

After a trip to the store, where a consumer has made a debit transaction, they can subsequently log on to their financial institution's online banking website and look at the transactions they've made. Many non-financial institution distributed debit cards (e.g. those that borrow a BIN from a valid financial institution) also offer a way for consumers to go on-line to check their balances and transactions.



Debit Applications and Web Banking: A Happy Co-Existence

Is That Card Loaded?

Consumers and businesses alike will often refer to a card as being **loaded** with a certain amount of money. Obviously there is no money “on” the card itself. Rather, the card is a reference to an account number within a host database, and that database that is the “book of record” to determine how much money a particular card has available.

Stored Value Cards (Gift Cards, Coffee Cards, Phone Cards, etc.)

Non-PIN based cards, such as phone cards, coffee cards, gift cards, etc., are based on proprietary applications that work with the particular merchant’s payment switches. Stored value cards are also referred to as closed-loop cards because they only have value with a certain merchant or set of merchants. The applications that enable these cards are proprietary and are implemented in conjunction with a merchant’s switch processor provider. Most often, these cards are activated or loaded via a point of sale device before they can be used. It is important to note that, like debit cards, there is no actual dollar amount stored on the card itself. Rather, each card has an account number that relates it to an account number in a host database. The host database is the book of record for the dollar value on any particular card. As such, from a technology perspective, these types of cards act like a debit card with the difference being that they only work with a single merchant or set of merchants.

These non-PIN prepaid cards do not fall under the domain of Interac or the Canadian Payments Association and are simply regulated by an agreement between the card user and the merchant. Merchants are free to implement their applications in a myriad of ways. Some merchants choose to “add value” to a gift card if you load the card with a certain amount (e.g. in a recent promotion, Starbucks adds \$10 to your Starbucks card if you load it with \$50.) Merchants are also free to remove value from a card if it is not used within a specified time (as an example, Rogers Video will start deducting \$2 per month from a Rogers Video prepaid card if there is no activity in an 18 month period).

Debit in Combination with Loyalty

There are remarkably few vendors who combine debit cards with any form of loyalty. One of the companies providing loyalty in combination with debit is TruCash. Otherwise, most loyalty programs are stand-alone (like Air Miles or Shoppers Drug Mart Optimum card) or work in combination with a credit card (like CIBC Aeroplan, Shoppers Drug Mart Optimum CIBC Visa, etc.) The low incidence of debit/loyalty combinations is due primarily to the tight margins afforded in debit card business. Credit/loyalty combinations are more popular because the higher margin credit businesses can more easily afford the cost of administering a loyalty program.

Prepaid Credit Cards

Prepaid credit cards, like those with a MasterCard, Visa or Amex logo act like any other credit card except there is a fixed amount that is “loaded” on the card. These prepaid credit cards also don’t require a PIN (a signature is all that is required). The reason a prepaid credit card may be desired instead of a debit card is for transactions such as booking a hotel or renting a car. Hotels and car rental companies generally don’t accept debit cards because they must pre-authorize an amount that may be charged at a later date. Prepaid credit cards do require a higher maintenance fee however (generally over 300% higher).

Debit and Prepaid Card Programs: Estimating the Cost

The factors affecting the cost of a card payment program vary greatly depending on the number (and type) of cards that are to be deployed, the marketing costs, and the cost of any operational labour that is required. As an example, for a payroll prepaid debit card program you would first estimate the number of cards to be used, the initial deployment costs (e.g. setting the PIN), the operational costs of loading these cards on an ongoing basis, the software costs and the capital equipment required.

Requirements for Implementing a Debit Card Program

If you own or operate a retail banking system today, chances are your system or software provider can offer you a solution for a card-based program like debit cards or prepaid cards.

At a minimum, you will require the following to implement a debit card program.

- A computer host that can be accessed securely from a switch provider (e.g. VPN).
- Retail banking software (e.g. Portfolio Plus Retail Banking Module).
- Web banking software with retail capabilities (e.g. Portfolio Plus Portcullis).
- A web server and requisite firewalls.
- Retail banking software and database.
- A switch provider partner.
- A BIN (either yours or a BIN from another financial institution).
- Operator(s) (somebody has to create and manage the cards).
- Cards (your switch provider can usually supply these for you).
- Marketing communications effort: you will need to communicate the features of your debit cards to your existing (or new) customers.
- Project management: you will need to create a project plan with milestones and test plans.
- Disaster recovery plan.

Requirements for Implementing a Prepaid Card Program

One of the primary decisions you will have to make is whether you want to build an entire solution yourself or leverage the work done by other companies. If you want a solution “in house” and you want to manage this solution yourself, you will need to perform similar steps to those outlined in “Requirements for Implementing a Debit Card Program”. However, you don’t have to go it alone. SIT has partners that can help. Give us a call.

Marketing and Business Requirements: Card Programs

What is your goal? This is the key question that must be answered before you set out to implement a card program. Is your goal to save costs? Retain more assets? Build customer loyalty? Keep up with the competition? There are numerous motivations for creating a card program. Once you've flushed out the potential upside that a card program can provide, you must work the cost-side. To get a better idea of the potential costs, talk to SIT or SIT's partners. Much of what you will learn is available at little or no cost and will accelerate your learning overall.

If it is for competitive reasons that you are considering a card program, you should perform some primary research. Send someone out to sign-up for a competitor's program. Have this person experience the card program in full (e.g. web access, paper statements, costs, sign-up procedure, PIN-changes, etc.). This will give you first-hand experience and potential ideas for doing it better yourself.

Conclusion

The technology and security infrastructure that enables debit card and other payment cards can be complex. Don't let this complexity intimidate you. Focus on the business plan and your potential added value. Perform your due diligence. Talk to SIT or SIT partners like InterCash or TruCash if you have questions. With over 130 solutions implemented to date, SIT can lend you a hand.

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