

Modern Mobile Data Capture Technology for Government and Enterprise
Applications—A White Paper

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Introduction

Entering handwritten forms-based data into computer systems efficiently and accurately has traditionally been awkward, expensive and time consuming. As reported by Gartner, the Information Technology research group, \$360 billion is spent annually on collecting and processing business forms data. Moreover, Gartner has estimated that for every dollar spent on completing paper forms, between \$30 and \$60 dollars are spent in processing those forms. According to Microsoft, even one form, such as a mobile data collection form, can cost a company over \$150 a copy to process. This includes labor and materials for printing, storing, filling out, receiving approval, correcting/resubmitting and entering the information into the enterprise business system. Unfortunately, as overall data processing costs have fallen, not much has been done about the “front-end,” or data capture process, especially where the data are collected in the field on paper forms. [Digital Output magazine, 2004]

This is in spite of the fact that the enterprise IT market has gone through many “business process re-engineering” phases over the past 25 years. These initiatives have continued even during the IT spending lull of the early 21st century. However, the vast majority of these initiatives have been focused on “back-end” data processing and storage improvements in the utilization of corporate data for running the traditional enterprise resource planning (ERP) functions—manufacturing, fulfillment, billing, and inventory and customer resource management (CRM). In more recent years, initiatives in “data mining” have also come into vogue.

Now, with many of the IT system back-end solutions being solved, enterprises are focusing on ways to reduce the cost of the front-end data capture portion of their IT workflow with new, mobile data capture hardware and software technology. By doing so, government and enterprise costs hope to further reduce IT costs and increase data collection efficiency, data timeliness and quality accrued, especially for enterprise mobile data collection applications.

Historically, enterprises have captured data in mobile environments through the use inking pens and paper. During the past decade, hardware devices such as Palm Pilots, Pocket PCs, touch screen PCs, and special purpose data capture hardware such as those used by Federal Express, UPS, DHL, etc. have evolved. Some of these systems have achieved success, especially in areas where the collection of data is highly categorical (a series of yes/no questions is a straightforward task on a PDA) or when the collection and tracking of data using special

purpose devices is a core component of their business proposition (e.g., Federal Express).

Today, general purpose portable devices such as Tablet PCs, Digital Pens and converged devices such as Blackberry's, Treo's and Smart Phones have reached a higher level of maturity and convenience. Consequently, these devices have become highly attractive for mobile data capture. Mi-Co offers forms automation software that exploits these new devices to help customers automating their current paper forms data capture processes and achieve a significant return on investment (ROI).

These Mi-Forms applications are the types that turn a general hardware device, in this case a Tablet PC, into a vertical or specific solution device. Digital ink applications on Tablet PCs can be an excellent fit for organizations needing to capture data while in a true mobile state.

- Kevin Burden, IDC Program Manager-Mobile Devices

Handwritten Mobile Data Capture

The core mobile data capture systems requirements met by Mi-Co include:

- A comprehensive system that allows for the completion of the four key tasks of enterprise mobile data capture:
 1. Forms Design
 2. Handwritten Data Capture and Recognition
 3. Data Verification and Validation, and
 4. Data Communication
- A flexible system built on an architecture that allows for meeting the changing needs of the business unit professionals capturing the data
- A user friendly system that provides a natural interface and allows direct input of handwriting with automatic conversion of the handwriting into machine readable form
- A standards-based system that is built on a validated architecture that facilitates centralized management and control by enterprise IT departments

"We want to make our mobile data capture activities easy to use, cost effective and flexible. In our pilot we are implementing Mi-Forms Software on Tablet PCs to test the system from form design through the communication of information to our databases."

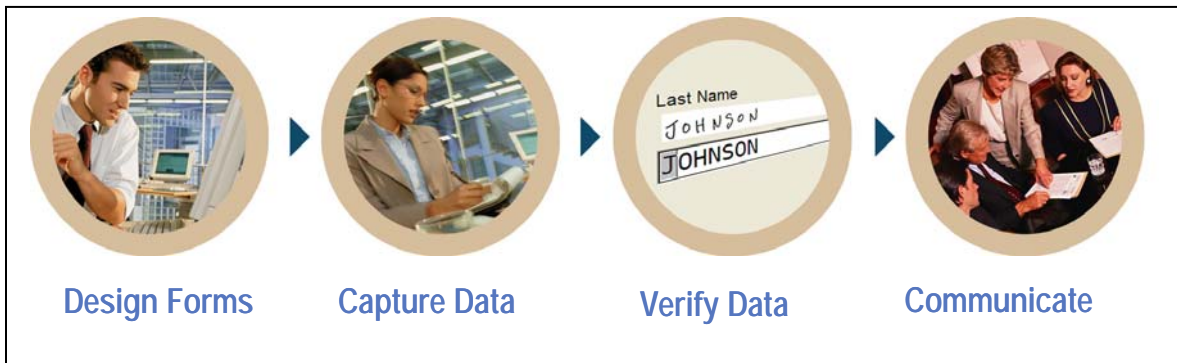
-Charles Schroeder, Spectrasite IT Director of Systems Development

The Mi-Forms Software System, through its multiple development cycles, has evolved into a system that meets all of these requirements for a large number of enterprise and government applications.

Mi-Forms Software System for Enterprise Mobile Data Capture

During the past six years, Mi-Co has developed five generations of Mi-Forms software focused on meeting specific mobile data capture needs in Mi-Co's target markets and the company's growing commercial enterprise and government customer base.

The core mobile data capture systems requirements that the Mi-Forms Software System addresses are depicted below.



Mi-Forms is used primarily with two data capture technologies at the present time: the Microsoft Tablet PC and the Digital Pen and Paper. In addition, support is provided for Pocket PCs and signature capture pads.



Tablet PC



Digital Pen

Tablet PCs

Microsoft Tablet PCs with Mi-Forms software is used to enter data into traditional appearing forms displayed on the Tablet PC screen. Mi-Forms software captures the “electronic ink” data and stores it in the Tablet PC for further processing including handwriting recognition and transmission to the Mi-Forms server. Mi-Forms software converts handwritten “ink” data to computer-readable text on Tablet PCs in near real-time. Thus, users collecting the data can verify the accuracy of the conversion at the time the data are captured.

Microsoft, the world’s largest software company, believes that handwriting will become the mobile data entry method of choice in the 21st century. Consequently, they have developed ink extensions for the Windows XP operating system and produced specifications for hardware vendors to build handwriting capture devices, called Tablet PCs that can be used to capture and translate handwriting into computer readable text. At the roll-out of the Microsoft Tablet PCs at the Jacob Javits Center in New York Center in November 2002, Bill Gates predicted that, "Throughout this decade, [digital] ink will become as popular as the graphic user interface became in Windows."

Microsoft’s Tablet PC hardware specifications have been implemented by more than 40 hardware partners, including Hewlett Packard, Toshiba, Fujitsu, Motion Computing, etc. Microsoft and their partners have spent millions of dollars developing and marketing Tablet PCs. Collectively, these companies have sold more than 1 million Tablet PCs. The market Microsoft and their partners are pursuing is huge.

A unique feature of Mi-Forms is that it permits users to enter data using natural handwriting directly on the form and correct mistakes in conversion to digital text in near real-time. No other software in the world today offers this important key to worker productivity.

“Mi-Co has been supporting Tablet PC since its inception... and has met the requirements to become a Premier Tablet PC ISV Partner. We are thrilled to have them as one of our leaders in this space,”
-Frank Gocinski, Microsoft Mobile Platforms ISV Business Development

Digital Pens

. In addition to Tablet PCs, Mi-Forms software supports Digital Pens for handwritten forms data capture. The Digital Pen includes an inking ballpoint pen that is used with standard stock paper. The paper has a faint dot pattern printed on it in the background which is sensed by the Digital Pen. From the dot pattern, the Digital Pen is able to calculate its position on the paper. A memory in the Digital Pen stores sequences of pen positions (coordinate pairs) from the handwriting. The Digital Pen Memory can easily hold over 200 forms (a more precise number depends on the percentage of each form that is filled). The

Digital Pen is connected to the PC via a USB interface for handwriting data transfer. At the time of this writing, Logitech, Hewlett-Packard, Nokia, and Hitachi-Maxell are suppliers of Digital Pens. The dot pattern and sensor based technology behind the Digital Pens was developed by Anoto, a Swedish company. (Gregory Clary, Mi-Co Co-Founder, was an invited speaker at the Anoto Partner Conference in Sweden in May, 2004.) Mi-Forms for the Digital Pen performs automatic interpretation of hand-printing, unconstrained writing and checkmarks, generates form images in a variety of standard formats, provides a graphical user interface for local or centralized results review and correction (if desired), and performs data validations and data communication to back end systems. The software source code is the same as that used on Tablet PCs.

"Mi-Co is on the leading edge of digital writing technology. Because of their technology leadership and their marquee customer and partner relationships with commercial deployment of our core technology, Mi-Co has been and continues to be one of our most valued partners in North America."
-Pietro Parravicini, CEO, Anoto, USA

Handwritten Mobile Data Capture Applications

Over the past 5 years, Mi-Forms has been applied to a number of market segments that have the key characteristics of forms automation needs: 1. mobility, 2. handwriting conversion to computer text, 3. timely access to high quality data, and 4. the IT infrastructure to support these mobile data capture activities. While Mi-Co has sold Mi-Forms software into a number of vertical markets, analysis of sales data shows that Mi-Co has been most effective in three markets. For 2005 and beyond, Mi-Co's marketing and direct sales resources will focus on these three markets plus the software OEM market enabled by Mi-Forms Version 5:

1. Healthcare (private and government)
2. Government Inspections
3. Commercial Field Inspections
4. Software Solution Developers

The competitive landscape for forms automation is evolving as digital ink and digital solutions gain greater and greater momentum in the marketplace. Currently, Mi-Co competition falls into four major categories:

- Existing paper-intensive, non-electronic processes
- Software companies that provide horizontal products for building digital ink applications, often focusing on one specific hardware platform
- Software companies that have a current application in the marketplace and are adding a digital ink front end for mobile data capture
- Software companies that support mobile data capture solutions on platforms that are weak in their ability to effectively handle handwriting and digital ink

The Mi-Co approach to mobile data capture has been validated by customers in North America, some of whom have used Mi-Forms for four (4) years. Selected Mi-Co customers include:

1. Internal Revenue Service (IRS)
2. United States Department of Agriculture (USDA)
3. American Tower/ Spectrasite
4. Jackson Memorial Hospital in Miami, FL
5. Wilson County, NC Home Health Agency
6. Boston, MA Public Health Commission
7. Allstream of Canada (formerly AT&T of Canada)

"In less than a year, BPHC [Boston Public Health Commission] expects to save between \$75,000 to \$100,000 due to the efficiencies introduced by this new technology. In addition, this technology has allowed for much more rapid processing of data through the system."

-Interview with Claritza Abreu, Director of Information Systems Services at Boston Public Health Commission March 2005

Contributing to Mi-Co's success are a number of important business partners. These include technology partners such as Microsoft, Hewlett Packard, IBM, Logitech, Anoto and Microsoft, plus sales channel partners GTSI, CDWG, Allstream (the former ATT&T of Canada) and others.

Mi-Co's level of technical support and exemplary turn around times for meeting some of our very demanding requests has been nothing short of phenomenal. Your professional research/support team is top-notch and a reason the ***Mi-Co product line remains the most innovative and flexible handwriting capture platform in the market.*** Allstream's ability to show-case this diversity is now reaping the benefits as we have several large enterprise customers and partners in the Canadian market ready to engage with us.

-Rick Da Silva, Managing Director, Allstream former AT&T Canada

Combining the best available modern mobile data capture hardware with the convenience of the traditional "pen on paper" interface paradigm, Mi-Co's flagship product, Mi-Forms, provides a mobile data capture solutions platform that can be used to automate any handwritten form in the world. Mi-Co has developed five generations of Mi-Forms software for this purpose and the software is available for free download at www.mi-corporation.com.