Bar Code Technology: Corrections' Management 2000

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Abstract

A new correctional management system is needed to see this industry into 2000. Bar code technology has proven capabilities of tracking objects and people. Correctional agencies presently using bar coding were interviewed and problems identified (e.g., low-end equipment, inadequate software, agency ignorance and poor training). Successful applications are also explored. Agency knowledge of this technology is crucial to successful implementation. Bar coding is shown to be a perfect match with corrections when implemented properly. A novel funding source, the inmate collect call phone system, makes this management system attainable for many agencies with restricted capital outlay monies. Bar coding is a viable, available alternative to manual inmate tracking.

Introduction

Research Problem

Management of resources has long been a primary concern of business. A study commissioned by the Small Business Administration and conducted by Donald F. Mulvihill in 1963, illuminated the problem. After setting the problem, Mulvihill concluded, "An investigation of small wholesalers in Alabama shows that the inventory or stock control problem is not one that has been overcome" (Mulvihill, 1963, p. 10). This concern is not confined to the private sector, as governmental entities have been forced to realize that they too must operate with existing or dwindling funding sources to provide existing or expanded services in the future.

Inventory, be it assembled parts, piles of iron ore, or collections of data, allow a business to provide a needed product or service, thereby satisfying a need and generating a profit. It can be said that the inventory of one governmental entity - corrections - is its inmates. Like the inventories of business, inmates are the resources of corrections that must be effectively and efficiently managed.

Because of the trend toward harsher sanctions against convicted criminals in today's society, the need for a cost effective inmate management system will rise on corrections' priority list. The private sector has addressed this profit-driven need with technology. Specifically, bar coding has provided the much sought reduction in staffing, as well as simplified accounting and inventory procedures. Precise controls can be maintained over inventory stocks, to include ordering, warehousing, and sales. In corrections, these functions are mirrored in admissions, housing, and releasing.

A similar implementation of available and emerging technologies must surely occur in corrections because of the demonstrated correlation between businesses' inventories and corrections' inmates. The traditional approach to inmate management, the cumbersome manual system, cannot survive today's philosophy of doing more with less.

"Bar codes, in themselves, are nothing more than identifiers. However, since bar codes only identify, they do nothing in and of themselves. They are catalysts that assist and speed information without becoming a part of the fundamental process or logic" (Baker, 1985, p. 13). Bar coding, with its proven capability of reducing vast numbers of inanimate objects to manageable levels may figure prominently in designing future correctional management systems.

Bar code technology must first be proven effective in a correctional setting.

Inmates, with their human ability to manipulate, will be a far more demanding test group than automobile engine parts or soup cans. This research will attempt to answer the following questions concerning this technology's suitability to the correctional setting.

(1) Will bar coding be a feasible alternative to manual inmate accountability from a security standpoint? (2) Is bar coding a cost effective correctional management tool or simply a new technology with primarily private sector applications? (3) How are corrections' agencies implementing bar coding technology? The latter became relevant when analyzing data gathered during interviews. These questions will be explored in an effort to determine the possible role of bar coding in the future of corrections.

Background

One need only look at any packaged item in stores to realize that bar coding appears practically everywhere in today's commercial world. For research purposes, bar coding and its uses must be defined.

"Starting in the mid-1950's, the development and ever-expanding use of the digital computer has been generating a requirement for faster and more accurate methods to input data for analysis and orderly event reporting" (Collins, 1990, p. 8). This requirement was presented to a gathering of defense technology specialists in 1959 by a group of railroad research and development managers. Their challenge was to solve the problem of gathering owner and serial number information from moving railroad cars.

A prototype system was developed in 1962 by the Sylvania Co. that used an optical scanning system which illuminated a label with horizontal bars of reflective red and blue tape on a non-reflecting black background. After testing this system with other proposed solutions, it was selected as the freight car control system for use throughout North America.

In its earliest applications, the bar code system operated by measuring the width of horizontal bars on a label by an optical sensor which measured each bar's reflected light. The technology quickly advanced to make equal use of the spaces between the bars.

The final push over the top of the acceptance barrier came from the U. S. Government in the form of the Clean Air Act (CAA). The CAA mandated strict recordkeeping of engine components by automobile manufacturers. Shortly after this bill's passage, one company was fined $90 million for failure to record 9,000 engines. Since this was an ideal application for a bar code system, it was quickly adopted by all automotive manufacturers (Collins, 1990).

The language, or method of placing bars and spaces in bar code technology, is called a symbology. When this symbology is used to print a message, it is called a bar code label. Although there are many symbologies in existence today, five are primarily used. The one most commonly encountered by the general public is the 11 Digit Universal Product Code (UPC), used by the American grocery industry and general merchandise retail stores. As we stand at the checkout counter, symbology on each item is translated into our final bill, complete with product description (Collins, 1990).

In the industrial setting, the Code 39 symbology, which encodes using the full alphanumeric set, is the most widely used. Its popularity increased greatly in 1981 when the Department of Defense mandated that its 40,000 plus vendors use these bar code labels to fulfill contract shipping requirements (Collins, 1990).

The proven functionality of bar code technology in inventory control by the

commercial and industrial sector is well documented. Periodicals such as I.D. NEWS and ID Systems, magazines devoted to automated data collection, report on the ever growing use of and advances in bar code applications. Two new bar code applications have been shown in testing to have character substitution error rates of less than one in five million (Quinn, 1995). Label print quality and laser scanning devices are improved continuously, setting the stage for even faster, more accurate data collection.

As previously stated, the correctional industry, and it is indeed becoming an industry, deals primarily with inventory of inmates. The need in this industry, however, has evolved from mere identification and control to accurate accountability of daily routines. From meals to educational classes, recreation to medical appointments, the need to document every activity is becoming a legal necessity from a liability standpoint. Bar coding, with inherent tracking and recording capabilities, seems to be a perfectly matched solution.

Given there is an apparent solution, one must ask why the field of corrections has not embraced bar code technology with open arms. Bar coding has virtually taken over the industrial and commercial world today. It is a newcomer to inventory control, having gaining widespread acceptance only in the mid-1970's. Corrections, as a whole, is still toying with the idea.

To err on the side of caution has long been corrections' mainstay. To misplace an article of inventory in a plumbing parts warehouse will not significantly impact that company's ability to operate or generate a profit. To misidentify an inmate, especially during the critical release process, however, would dramatically impact that correctional agency's ability to operate effectively in the eyes of the public, who are the shareholders of the corrections industry.

To determine the current state of bar code usage in corrections, it is necessary to interview representatives of as many agencies as possible who have had experiences with this technology. Successes and failures are of utmost importance: the reasons for these successes and failures are crucial to the final outcome of this research.

Methods

This research project was conducted by literature review, both historical and of existing data on in-use bar code applications in both the private and correctional sectors. In addition, recorded telephonic interviews were conducted with correctional agencies who currently use bar code technology or plan to use it in the future.

Interview Procedures

Twelve corrections agencies were interviewed who have previously used, are currently using, or plan to implement bar coding in the future. Eleven agencies agreed to a recorded interview answering a standardized questionnaire. One agency declined to be recorded and was sent the questionnaire. That agency responded in writing to some of the questions.

The inmate populations, or inventories, of the responding agencies ranged from 32 in Bosque County, Texas, to 25,000 in Los
Angeles, California. As varied as these inventories are, the degree of bar code usage was equally diverse.

Respondents were sorted into two groups for comparative analysis based on total

inmate capacity - those with capacities under 1000 inmates (group A) and those with capacities over 1000 (group B). Group A consisted of four agencies; group B had seven agencies. One respondent was utilizing bar coding only in its police evidence room and on corrections' employee identification cards, and therefore is not included in either group. The system requirements of the two groups, both operational and technical, were vastly different and responses to questions readily bore out those differences and required that the data be analyzed by group rather than in total.

The questionnaire was divided into eight major categories: background, bar code motivator, agency requirements, research, selection, implementation, post-implementation, and open forum (See Appendix A). This was done to gather as much information about the agency itself, as well as its progression to usage of bar coding as a management system. The Results section will progress by questionnaire category.

It should be noted that not all agencies interviewed responded to all questions. Also, some agencies' responses to one question negated one or more subsequent questions or entire categories. As such, all agencies in each group will not necessarily be represented by data in each of the questionnaire categories.

Group Profiles

Group A, consisting of four agencies, ranged in capacity from 32 to 650, with the group average capacity of 400. Three of the agencies operated one facility, with one agency operating two. All facilities operated by these agencies were converted, or will convert in the near future, to bar coding.

Group B, consisting of seven agencies, ranged in capacity from 1000 to 25,000, with the group average capacity of 5500. Four agencies operated one facility; two operated two and one agency operated twelve facilities. All facilities operated by these agencies were converted to bar coding.

Results

The data gathered from the telephonic interviews are discussed in the following subheadings. They follow the same order in which they appeared on the interview instrument, with only the last section, open forum, omitted. Comments made there are addressed in the discussion portion of this project.

Bar Code Motivator

In group A, the ability to obtain true inmate tracking was the primary reason given for choosing bar coding for three agencies. One agency only bar codes the inmate's social security number and it is utilized strictly for commissary purposes. All agencies expect future benefits from bar coding, the most significant being paperwork reduction and increased accountability and security. Integration of other support sections, such as commissary, property room and medical services, are scheduled to be on line in the near future for three agencies.

In group B, six agencies listed true inmate tracking as the primary motivator, with varying degrees of system integration. One agency's motivator was the fact that it was a free service offered by an inmate collect call telephone supplier. One of the seven agencies will implement bar coding in 1997, and two have implemented, then terminated bar code use. Four agencies presently have bar code systems on line. Three of those

agencies have integrated their commissary, property and medical sections. Three of the four agencies stated that their paperwork was greatly reduced through the use of bar coding. One expected certified staff would either decrease or that same staff would be able to increase their workload.

Agency Requirements

All four group A agencies either planned or have integrated video imaging with bar coding. Three of the four sought single source suppliers for all system components. No funding ceilings were imposed on any agency.

Likewise, all those responding in group B either planned or have integrated video imaging. Five sought single source suppliers for system components, with two accepting the system they were given with inmate phone system contracts. In all, only one agency listed a funding ceiling, while three received their bar coding and other integrateable systems free with inmate phone contracts.

Research

Two agencies in group A stated they conducted studies prior to selecting a supplier of both bar code hardware and software. One agency received a study by a prospective supplier. One agency received the services free with an inmate phone contract.

Three agencies in group B conducted studies and three received the services free with the phone contract.

Selection

Of those responding in group A, cost was the primary reason for awarding the bid for two agencies, with one agency listing system reliability. Two respondents made recommendations on the selection, while one was involved with the final decision to award. Two agencies bore the cost of training personnel while one was trained by the system supplier.

Of those responding in group B, one award was made on cost alone. One looked at the best system for the price, while one only looked at one supplier. Three agencies were supplied with the systems through the inmate phone contract. Two respondents in this group made the final selection decision. The cost of training was borne by three agencies, while one split the costs with the supplier.

Implementation

Two responding agencies in group A implemented bar coding in 1991, while one will begin in 1996. Only one agency integrated with existing computers, while one integrated with the phone system. Only one agency encountered serious problems with the initial bar coding hardware, having to completely replace it. No notable problems were encountered with the software. Very little resistance was reported with the staff during implementation. One agency stated that the resistance they encountered was dealt with by removing the staff's other options. Little resistance came from inmates and was handled through in-house disciplinary actions.

Group B agencies implemented bar coding as early as 1992, with one planning to implement it in 1997. Little integration with existing resources was noted, with two

agencies utilizing the existing mainframes and one using existing PC's. Only one agency encountered problems with initial hardware, which were configuration problems. One agency also noted problems with the software. Of the two agencies who reported problems with staff resistance, one promptly discontinued using bar coding while the other initiated training. Only one agency encountered resistance from inmates, citing religious beliefs. The number of resistors was small and their policy to ignore them was successful.

Post-Implementation

Only one agency in group A found other applications for bar coding after initial implementation. Three were still using the original equipment, while one replaced all equipment with updated models. Only one agency had conducted a post implementation study on efficiency and cited reductions in operating costs, most notably paper.

Group B had one agency expanding applications after implementation. The remaining respondent agencies were still with their original suppliers. All agencies stated that the suppliers were responsive to their needs and none had conducted post-implementation studies.

Discussion

The respondents to the questionnaire voiced many concerns with bar coding as a correctional management system. The background data provided a look at a very diverse group, both in size and geographical locations. Surprising to this writer was the fact that so few correctional agencies, be they county, state or federal, have actually taken the plunge with bar coding. Although a relatively new concept to the corrections' industry, it has been proven that bar coding has the inherent capability to accurately track items or people. No previous work could be found which specifically addressed bar coding as a corrections' management system.

One point that emerged from most of the respondents who noted difficulties with bar coding was that the technology did not match their particular operation. By technology, it was meant that the hardware was not sufficient to handle the number of inmates and their activities. It was common that the system had worked well in other smaller applications; however, it cannot keep up now or is always crashing.

From these repeated comments, it became apparent that the suppliers of bar code technology, both of hardware and software, were throwing the same solution at each problem. This strategy did not work in the private sector and manufacturers and suppliers developed a more individualized approach to each new customer. Today, suppliers conduct extensive on-site studies of potential customers, learning not only the physical layout but the organizational philosophy to ensure the best match of technology to client. To date, this has not been the norm in corrections.

Another common problem encountered by many was that the hardware, particularly the scanners, were not 'user-friendly' or the task of scanning was too time consuming for the available staff. The latter was reason enough for one agency to discontinue the use of bar coding.

Another agency, Prince Georges County, MD, temporarily discontinued bar coding in some applications due to unreliable scanners. Working with a funding ceiling on a direct purchase basis, they required 25 scanners. That funding ceiling only allowed them to

purchase the $100 pen scanner models. Lt. Col. Crumbacker of that agency stated that after trying out the 'sport model', at $2500, it performed perfectly (C. Crumbacker, personal communication, January 25, 1996). Clearly, low-end hardware will not provide the performance levels needed for bar coding to be either efficient or accurate. Without both accuracy and efficiency bar coding will never be accepted in corrections, and rightly so.

The largest responding user agency, Los Angeles, CA, has had previous experience with an inadequate system. With a daily population between 20,000 and 25,000 inmates, operating from 12 to 14 facilities, the need for a high-end system is apparent. They typically move 3000 to 5000 inmates daily to court, hospital, etc., the majority of these in a four to six hour window. They expect to have full-blown implementation completed near the end of 1996.

Up to this point, only the negative issues concerning bar coding experiences in corrections have been discussed. As corrections will realize, the problems must be identified before adequate solutions can be formulated. The problems identified in this project can be attributed to several factors.

First and foremost, bar coding is a radically new management philosophy for corrections. Relying on electronics rather than human senses for inmate accountability will basically take some getting used to by corrections' administrators. With this new way of doing things, little existing data is available to learn from. An unknown person once said that experience comes from good judgement and good judgement comes from bad experiences. We are just beginning to accumulate those bad experiences from which to learn.

Secondly, a new paradigm must be developed not only by corrections' administrators but the corrections' workforce itself -the line officers and supervisors. Hesitation was encountered by the majority of respondents, with varying degrees from slight to great. The group with the greatest resistance was also dealing with inadequate equipment. One agency, Central Booking Facility in Baltimore, MD, reported no resistance from staff and the reason was made very apparent. Assistant Warden Michael Wandby stated "They're all young and they're all new, and very few have seen anything else" (M. Wandby, personal communication, January 26, 1996). For them, a paradigm shift was not necessary - they were already there.

Thirdly, the technology providers must respond to corrections' unique needs as they have with the private sector. To date, they have not tailored the technology to the specific application of corrections. This will inevitably change as the potential profits from the vast numbers of correctional facilities in this country alone are discovered. This practice of site-specific application development has been done with private businesses successfully for some years.

Another private sector push will have to come from corrections itself. The majority of inadequate or failed systems noted by respondents were those in which corrections had relatively little specific input. Rather than researching available equipment and suppliers, many relied solely on systems provided to them as part of an inmate collect call phone system. One agency spoke to and eventually purchased from only one company. Corrections' personnel must become knowledgeable in this field and demand systems which will operate effectively in our demanding industry.

The initial capital outlay necessary to successfully implement bar coding is staggering, if not out of the question, for many agencies. Capital outlay budgets are very

restricted - in some cases shrinking - and new funding sources must be found.

One of the most promising new possibilities has presented itself to corrections from a most unlikely source. The contract inmate phone system provider could be the vehicle to a new inmate management system for many agencies. Collect call systems have been popular in corrections as a revenue source for some years. These companies are now offering, in lieu of the total commission possible, reduced commissions supplemented by new services. The new services available include video imaging, fingerprint recognition, voice recognition, and yes, bar coding. Integration of all the above systems is possible and very comprehensive inmate management systems are now a reality without a large capital outlay. Four of the responding agencies were able to implement bar coding in this way.

As with direct purchases, strict controls should also be in place with a relationship such as this. Agencies are obliged to actively solicit pertinent information on available systems. They must know what their needs are and what, at a minimum, it will take to fulfill those needs. Agencies have no choice but to dictate to the provider the equipment quality and capabilities needed to successfully allow them to operate into the 21st century. This is a very real possibility and this writer's agency is presently soliciting bids for a total management system, to be acquired as a result of the awarding of an inmate phone system contract.

Conclusions

Several phenomena are realized by this research. The problems inherent in present manual (or mainframe) inmate management systems will continue to grow in the future as inmate populations are predicted to grow. Capital outlay monies for corrections, aside from building new facilities and salaries, are not expected to grow. The present manual accountability system will not adequately keep pace into 2000 and beyond.

Is bar coding the answer? Deputy Ray Mitfield of Los Angeles stated, "Our feeling is that they are very positive in terms of efficiency. They allow us to do the same job with less manpower or to do more work with the same amount of manpower. We feel it's a very positive and advantageous system for everybody" (R. Mitfield, personal communication, January 25, 1996).

Lt. Colonel Crumbacker of Prince Georges County, MD, stated, "Bar coding is the way to go. I think it's the way of the future for corrections. However, the thing to make sure of is that the technology is advanced enough to take care of a large institution" (C. Crumbacker, personal communication, January 25, 1996).

This research began to answer two prominent questions concerning bar code technology and corrections. The first is whether bar coding can be a feasible alternative to manual inmate accountability from a security standpoint. Secondly, is bar coding a cost effective correctional management tool or simply a new technology with primarily private sector applications? While conducting this research, a third question emerged with important implications. How are the pioneer corrections' agencies implementing bar coding technology? Much information emerged about these research questions.

With the present state of bar code technology and the everyday advances being made, security will be safeguarded with this system. It will be incumbent upon corrections' administrators, however, to demand that the best technology available and affordable is utilized.

The second question dealing with cost effectiveness may well find its answer for

many agencies in the inmate phone systems discussed previously. I personally believe that bar coding would be cost effective even if purchased with capital outlay funds. The reality, however, is that those capital outlay funds are not available for every agency. A reduction in operating costs and the ability to account for larger numbers of inmates with true inmate tracking history capabilities are realities, and available for many without any capital outlay through an inmate phone system. I find this to be the epitome of cost effectiveness.

The responses to the final, emerging question give us perhaps the most powerful message of them all concerning this technology and its corrections' applications. YOU GET WHAT YOU PAY FOR! Low-end equipment will yield low-end results. It will be the responsibility of the corrections' administrator to ensure that the agency's specific needs are identified. Available technology must also be researched and matched to management's needs. This survey's results show that corrections cannot presently rely on technology suppliers for this. It should only be a matter of time, however, before the suppliers realize the market potential in corrections and become more customer oriented in system design.

Afterthought

To state from this research that bar coding is the answer for each and every correctional agency would be wrong. I believe that it has shown itself to be a very accurate, fast and reliable technology with definite correction's management applications. Each agency will have to step back and look at their operation from two vantage points, now and into 2000. Is the current system working adequately now? Will it work adequately into 2000? If the answer to either of these questions is doubtful, bar coding should be given a hard look.

Captain Don Redmond is a 24-year veteran in the corrections profession. Spending the past eight years in services, he is currently in charge of support services at the Pretrial Detention Facility for the Jacksonville Sheriff's Office. His professional interests are in the modernization of operations. A primary goal is to allow increased security staffing as a result of reductions in services staffing allowed by the integration of new technologies into routine correctional operations.

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Appendix A

Interview Questions

Background

- Number of facilities in system;
- Inmate capacity and classification of each facility;
- Were all facilities converted to bar coding?
- If not, why?

Bar Code Motivator

List primary/secondary reasons for choosing bar coding:

- Increased accountability/security
- True inmate tracking
- Staff reduction (certified)
- Paperwork reduction (clerical)
- Ability to integrate other services:
    - Commissary
    - Property Room
    - Fee for services (medical)
    - Staff equipment
    - Other

Agency Requirements

- Did you wish to integrate bar coding with other technologies?
    - Video imaging
    - Armband product availability
- Did you seek single source supplier for all system components?
- Was there a funding ceiling?

Research

- Were any studies conducted by your agency prior to selection?
- Were any studies conducted by prospective suppliers?
  If yes, contact person and #
- Were studies reviewed which were conducted by other using or considering agencies?

  If yes, contact person and #
- Other applications identified when researching users? Suppliers?

Selection

- What was the primary reason for awarding bid?
- Were separate suppliers of specific components selected?
  If yes, elaborate.

- Was ceiling on available funding a primary concern in awarding bid? Secondary concern?
- What was your involvement in the selection process?
  - Operational input
  - Recommendation only
  - Involved in final decision
  - Made final decision
- Name of original supplier(s):
  - Hardware
  - Software
- Cost of training personnel:
  - Borne by agency
  - Borne by supplier

Implementation

- Date bar coding was implemented:
- Was bar coding integrated with existing resources?
  - Mainframe
  - PC's
  - Other equipment
- Immediate problems encountered with:
  - Hardware
  - Software
- Was resistance encountered with:
  - Staff
  - Inmates
- What remedies were effective/ineffective?

Post-Implementation

- Were other applications found after implementation?
  - Using existing hardware/software
  - Requiring upgrades or new equipment
- Are you still using equipment from original supplier?
  If not, why?
- Current supplier responsiveness to agency needs/concerns;
- If not with original supplier:
  - Current supplier
  - Cost involved with change
- Have any studies been conducted since implementation in:
  - System efficiency
  - Staff Reduction
  - Operational cost reduction (non-staff)

Open Forum

- Share your feelings on bar coding in corrections openly, be they positive or negative.

Literature Request

- Copy of your agency RFP (bid specifications);
- Copy of proposal by awarded company;
- Copy of SOP/directives related to bar coding.

Waiver

- Obtain permission to record entire interview prior to beginning of questions;
- Obtain permission to use remarks in possibly published material (specific SOP's/directives excluded).