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The Role of Bar Coding In Society

An

Interactive Qualifying Project Report

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Abstract

This interactive qualifying project has examined the role of bar coding in industry. Some selected symbologies of bar coding and their applications have been documented. A short history of bar coding is documented as well. A local Shaw's™ supermarket was visited where we examined how bar coding, specifically the Universal Product Code (UPC), has made running the store easier. We conducted interviews with managers and staff members of Shaw to understand how the UPC has assisted in ordering products such as milk and ice cream, and keeping track of what products are already in the store. They told us about the supervisory ordering system. It is a system that uses the cash registers and the UPCs to automatically order products based on what has been scanned in at the cash registers. In order to see how the system has helped the store, we focused on three different products: canned corn, ice cream, and milk, and examined how each item was handled by the supervisory ordering system. Furthermore, a brief look at what the Post Office is doing to improve its service is documented. Also, we conducted interviews over the phone with postal workers in an automatic mail-sorting center in Providence and Nantucket, Massachusetts. We learned that the Postnet code is used to help automate the sorting and sending of mail. Other codes used at the Post Office are for tracking important packages, such as priority mail, and confirmed delivery mail. The main objective of the Postal Service is to completely automate its service through the use of bar codes.

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Chapter I. Introduction

1. Introduction

Throughout human history, man has sought to improve his life in many ways. He is always looking for quicker and easier ways of doing things. At the beginning of the industrial revolution, machines were being put to use in factories to help produce goods quicker with less human labor. For instant, Henry Ford's assembly line made possible for the mass production of automobiles. Automobiles were coming off the assembly line with different variations. They came in different colors, and they had different internal features. When cars were stored in inventory, it was difficult to keep track of what cars have internal features on them. Something was needed to keep track of the cars in the large warehouses. One such idea for keeping track of the cars was the bar code. Bar coding is the use of parallel lines and spaces of different widths to hold specific information. A machine eye can read these lines and spaces for quick decoding of the information. They were first used mostly in grocery stores and the railroads in the late 1960's and early 1970's.

The object of this project is to determine the role of bar coding in society. How have bar codes made life easier for consumers, manufacturers, and the commercial industry? Where did the idea of bar coding first come from? These and other questions will be answered in this report. In the following chapters, the role of bar coding will be established. Where it came from, what are its applications, and where it will possibly be applied in the future. The history of the methods of bar coding, and different aspects of information content will be explored in Chapter 2. In Chapter 3, the role of bar coding will be examined in specific applications, such as in a grocery store. How it has been utilized in each particular area, and how

it has helped out will be documented. Finally, in Chapter 4, the results of this project will be thoroughly discussed.

Chapter II. The Aspects of Bar Coding

2. Introduction

Bar codes are Morse code, printed out with different widths of lines representing dots and dashes. The bar code was first seen in the form of a card sorter, patented by J.T. Kermode in the year 1934 [4]. Although it didn't really appeal to many, it helped stir interest in bar coding. The commercial industry showed the first interest of using bar coding. The main idea was to use bar coding as means of automating the check out counters at market places, and thus cut out the need to type in the price of each time a product is sold or stored. Wallace Flint, the son of a grocery storeowner made the first documented benefits of an automated checkout system in 1932. He used punch cards to store information such as price and characteristics of items or products a customer wanted. A customer would select items, like canned corn, that he or she wanted from a catalog and then removed the punch card for the canned corn. The punch card was then handed to the cashier. The cashier would put the punch cards into a punch card reader, and the codes for the items would be entered into the system. The items would then be delivered to the checkout counter from a storeroom by a conveyor belt. A complete bill of sale for the customer was produced and inventory records would be generated [1]. The idea was dropped because the labor at that period of time was relatively cheap. Automated checkout again resurfaced in the 1940's. Using a symbol like the shape of an archery target, a new system of automated checkout was developed and patented. It was tested in grocery stores in Cincinnati, OH in the cash registers. Similar to bar coding, it used different width of lines and spaces to store product information, such as the cost of the canned corn it was printed on. An electronic eye using a laser was used to read the "bull's eye" code and transferred information into the cash register. This system was a good idea, but the economics and technology at the time still had not

advanced enough to employ it. Computers at that time were too big and expensive to consider using in grocery stores. Many other ideas came and went in the 1950's and 1960's. Then in the mid 1970's, a committee formed by the grocery industry developed the Universal Product Code (UPC) standard for commercial supermarkets [4]. The UPC symbol, along with the European Article Numbering (EAN) system, developed shortly after the UPC, became the commercial industry's standard for bar code symbologies. A more detailed description of the UPC and the EAN will be given later in this chapter.



Figure 1: Codabar

In the industrial business, several bar codes were developed for use in many applications at about the same time the UPC was being developed. Codabar (shown in Figure 1), a symbology developed by Monarch Marking System, was used in both libraries and hospitals [4]. Codabar stored information using numeric characters, and uses alpha characters as start and stop characters. The numeric characters consisted of one wide space and one wide bar in a group of four bars and three spaces. The alpha characters consisted of one wide bar and two wide spaces in a group with the same number of bars and spaces as the numeric characters. Codabar had a density ranging from 3.6 to 10 characters per inch. In libraries, they were used to sign out books by just scanning the bar code on them and a bar code on the person's library card. A person simply brings the book(s) he or she wishes to check out to the checkout desk. The librarian takes the book, and uses a hand held scanner to scan the Codabar code on the book. This tells the computer database what book has been checked out of the library. The librarian then asks for the patron's library card, which also has a Codabar code on it, and scanned it in.

Now the library database knows who has checked the book out. The database also knows when the book is due, and where the patron is who checked it out lives. Before the use of Codabar, books were signed out using cards that were stored in the back of the book. A person who signed out a book took it to the checkout desk, took the card out of the back of the book, signed and dated it, and gave it to the librarian. The librarian would then store the card. The problem with that was cards could be misplaced or lost.

In blood collection, it helps to organize the different types of blood into groups. By bar coding the containers of blood, it is easy to scan them into a database to keep track of exactly what type of blood has been collected. Trained nurses and doctors collected blood into bags. The bags are then labeled with the Codabar code corresponding to the type of blood group contained in it. It is then scanned using a handheld scanner, and the information on what type of blood is collected is stored in the hospital's database. The hospital now instantly had a record of how much of what type of blood they had collected at a blood drive. Before the hospital workers kept track of the blood by writing on the bags what type of blood was in them, and then cataloging what they had collected by hand in notebooks. Codabar has made it easier for the hospital workers by eliminating the need to write down what they collect. That information is now stored in the hospital's computer database.



Figure 2: Code 39

At about the same time as the standardization of the bar codes used in the commercial businesses, bar codes were standardized for the industrial businesses. The commercial businesses deal with supermarkets and retail stores, companies that sell food and

household products. The industrial businesses deal with companies that sell parts and supply to other companies. The first symbol, Code 3 of 9 (Code 39) was the first bar code to be able to store alphanumeric data. Figure 2 is an example of Code 39 taken from [6]. Before this, bar codes only stored information numerically, that is, only in numbers. The name Code 3 of 9 means that there are 9 elements of bars and spaces used per character, and three of those 9 elements are wide. Code 39 was, and still now is for the most part, one of the most highly used bar codes in industry. It was mainly used in warehouse applications, like in C&S, to help keep track of what is stored in the warehouse, and what they need to put on trucks to send to grocery stores like Shaw's. The Code 39 is put on boxes and crates that are stored in the C&S warehouse. As boxes are taken in and out of the warehouse, the workers scan them. Scanning items, like cases of ice cream, in and out of the database at the warehouse allows C&S to know exactly how much ice cream they should have in the warehouse. The other bar code symbol, Interleaved 2 of 5 (shown below in Figure 3 [2]), was also used prominently in warehouse and shipping applications. In Interleaved 2 of 5, 2 of the five bars in the code are wide.

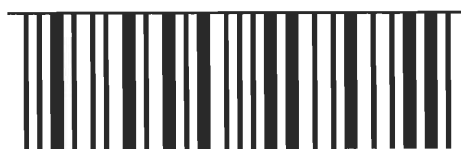


Figure 3: Interleaved 2 of 5

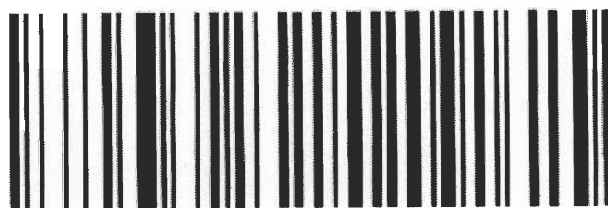


Figure 4: Code 128



Figure 5: Code 93

In the 1980's and 1990's, attempts to maximize the amount of information stored in a bar code symbol while making it as small as possible were made. The Code 93 and Code 128 (Figures 4 and 5 [2]) were two of the bar codes that came about, as probable replacements for Code 39. Both codes are alphanumeric and use a smaller area than the Code 39. Code 39 has a density of 9.4 characters per inch, while Codes 128 and 93 have a density somewhere between 12 and 24 characters per inch, depending on the mix of the characters, alphanumeric or straight numeric [2]. Despite this obvious advantage, however, Code 93 and Code 128 were not widely accepted. They became complementary to the already established Code 39. Information that could not have been stored in Code 39 in a small space, such as on a small box containing packages of screws, could be stored in either Code 93 or Code 128. Information stored in either Codes 93 or 128 could include a detailed description of the screws, what type they are, how many should be in the box and who will make them, etc. Also, the scanners that can scan Code 128 and Code 93 can also scan Code 39, making it more cost effective, since separate scanners don't need to be purchased for each code.

Other bar code symbologies such as Postnet, Code 49, and Code 16K were developed. Code 49 and Code 16K were matrix symbologies, meaning they contain data in rows stacked on top of each other. This allows information to be stored in an even smaller area. Both of the codes were also used to complement the use of Code 39. As with Codes 93 and 128, Codes 49 and 16K were used to store more information about a box that could not be stored in a

reasonable space by Code 39. Information such as the storage conditions for containers holding fragile objects, like dishes can be documented. The Postnet code was used by the United States Postal Service, and still is in use today. Thanks to the Postnet code, today mail can be sorted at a higher and more efficient rate with great accuracy. The Postnet code encodes a 9-digit numeric number. The first five digits encode the zip code of the address, and the last 4 digits of the code encode a special number assigned to an address in the area code. The Postnet and other bar codes being used by the post office will be explained a little further in Section 3.1 of this report.

2.1 Printing and Scanning

Many ways for printing out bar coding were developed over the past several years. The most recent ways have been laser and inkjet printers. Printing with these two methods is easy, but inaccuracy may occur at times. The bars in the code need to be as cleanly printed out as possible, so the scanning device can read them without a problem.

There are also several types of scanning devices out there used to decode the various bar codes. Handheld scanners are some of the popular types of scanners. They can be seen sometimes being used by managers in grocery stores, scanning items that need to be ordered for the isles. There are also stationary scanners, like the ones used at supermarket checkout counters. For these scanners, all that is needed is to move the bar code over the scanning eye. Information from anyone of these types of scanners is sent to a database, like the one in a grocery store, to be stored and examined later.

2.2 UPC and EAN Symbols

The UPC bar code symbol was first developed in 1973. A committee was called together by the various chains in the commercial industry to help develop a standard bar code for commercial stores. The goal was to facilitate an automatic scanning of item numbers with associated price identification at the point of sale [1]. The symbology was to have the capability of being scanned in any orientation. It also needed to have a first read rate ability of 99%. A first read rate of 99% meant that the UPC needed to be interpreted correctly by the scanner 99% of the time when it read the UPC. The UPC was designed to identify specifically the product and its manufacturer.

The UPC coding scheme consists basically of a 12 digit numeric code (shown in Figure 6 [6]). The first six digits in the code identify the manufacturer. The next five digits in the code identify the product itself. The final digit is the check digit, which is based upon some other mathematical relationship of the other digits in the symbol. When scanned, the UPC will tell you what product you have and who made it. Also, the check digit will let the scanner know if the UPC was scanned properly or not, thereby decreasing the margin of error.

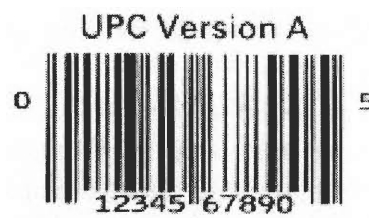


Figure 6: UPC Version A

The UPC is a fixed length, numerical, continuous symbology that uses four different element widths. It comes in two different versions. UPC Version A is the one version that can be seen most often on the items one buys in stores, such as milk or canned vegetables. It

is what the cashiers scan at the checkout areas. Version A consists of the 12 digits established in the UPC coding scheme. The symbology itself is separated into two halves by two guard bars in the middle. There are also two guard bars on the far left and right of the symbology, acting as start/stop characters. That is telling the scanner where to start and stop reading. UPC Version E is a smaller symbology and only encodes six digits. It allows manufacturers to encode a limited number of 12 digit codes into six digits. Thanks to this technology, manufacturers are able to label smaller packages, like bubble gum, to help identify the contents to the scanner.

The UPC standard helped propel the wide acceptance of bar coding with its success in the commercial industries. It has helped to benefit supermarkets and retailers in their sales and how they do business. In the supermarket, the use of the UPC has allowed managers to keep track of what items sell the best at a certain time of year, by keeping track of what has been sold in previous years. The UPC made this possible. Items that were scanned at the checkout counter were immediately stored in a database that kept track of the quantity of goods being sold. Retailers, such as K-mart and Wal-Mart, started using the UPC a couple of years after it was being introduced in supermarkets [1]. Today, you can find the UPC symbology in many supermarkets or retail stores. The UPC has helped to save up to a total of about 30 billion dollars in revenue in the grocery and retail industries [3]. It has done so by making sure there is no misreading of the price of an item. For example, if an item such as canned corn is mispriced lower than the real price, the customer always gets it at the lower price, costing the store money. The UPC almost completely eliminates this problem by having the price for the canned corn in a database for the UPC symbol on the can. Very little mistakes can be made here. This way of saving money also applies to the retailers. As Bob Martin, former president of Wal-Mart put it, “the UPC has raised business standards, and that’s a pretty tall order for little black bars [3].”



Figure 7: EAN-13

The EAN, also known as the World Product Code (WPC) and as International Article Numbering (IAN), was developed in Europe due to the interest in the American-made UPC [1]. The EAN is a widely adopted symbology. It is used throughout the European Nations. Scanners in Germany can read an EAN symbol printed in England. The EAN is almost identical to the UPC symbol. There are two major differences between them. The EAN encodes 13 digits instead of twelve like the UPC Version A. The symbols for the EAN and the UPC are identical. The thirteenth digit is a check character and is derived from the pattern of the first six digits in the symbol. The other difference is that in the first two digits of the EAN, the code for the country where the product comes from is imprinted. However, scanners made for the EAN read UPC symbols with no problem. Scanners made for the UPC before the EAN were developed, were unable to read the EAN. Despite this, both symbologies created much interest in the applications of bar coding. In the next chapter the application of the UPC is considered in a case study.

Chapter III. Case Study

3.1 Shaw's Supermarket

The UPC has become a very intricate part of the retail industry. Its application has made it easier for many retail and grocery stores to efficiently move customers through the point of sale (POS) faster and to keep track of the current supplies within the store itself. One such company that has benefited greatly from the use of the UPC bar code symbology is Shaw's supermarkets. Shaw's is one of the main supermarket chains in New England. We visited a local Shaw's supermarket to examine how the UPC bar coding symbology helps to track products in their store [5]. It is located on Gold Star Boulevard in Worcester, MA. At the time of the study, there were 134 people employed within the store in approximately three shifts. The store is open from 7am to 11pm at night Monday through Saturday. On Sundays the store is open from 7am till 8pm. The morning shift starts from 7am till 3pm. The afternoon/evening shift works from 3pm till 11pm. Finally there is an overnight shift that works from 11pm till 7am. The majority of the employees work during the afternoon/evening shift. Most of the business is done in this shift since potential customers are usually just getting out of their jobs in this period of time. Below in Figure 8 is an outside shot of the store, to give a slight idea of its location and size.



Figure 8: Shaw's Supermarket at Gold Star Boulevard

Figure 9 shows a rough layout of the store and how many aisles are in it. The store floor itself is roughly 131ft wide by 231ft long. There are a total of 16 aisles in the store. Each aisle contains different items in it. Table 1 gives you an idea of what is in each aisle of the store.

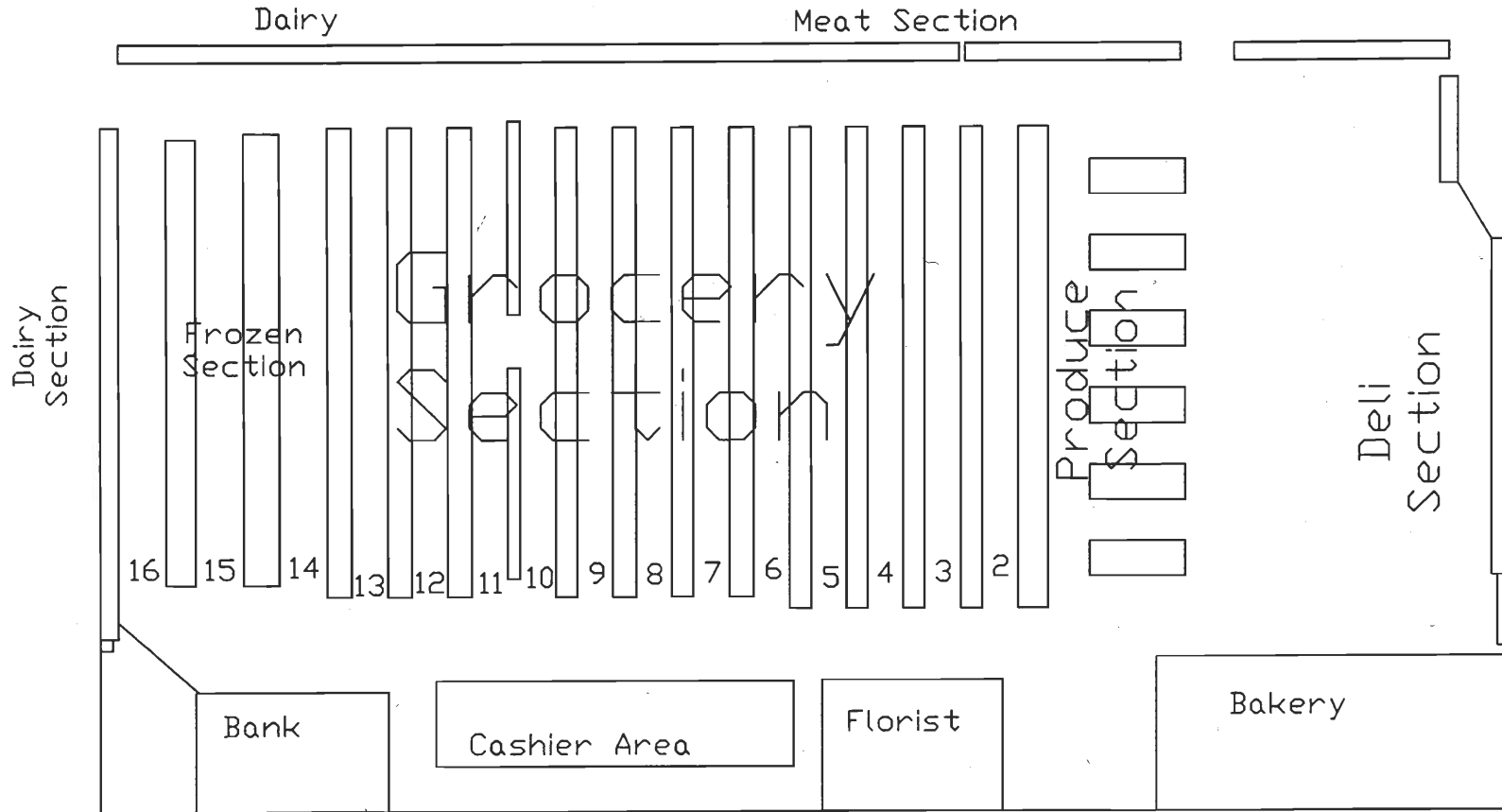
Table 1: Aisle Listing

| Aisle Number | Products in Aisle |
|--------------|--|
| 1 | Fresh fruit and vegetables |
| 2 | Canned vegetables, condiments, salad dressings, rice, beans, vinegar, stuffing, pickles, and canned tomatoes |
| 3 | Canned meats, spaghetti, spaghetti sauces, and soups |
| 4 | Baking items such as baking soda, flour, sugar, and candies. |
| 5 | Granola, cereals, and assorted juices |
| 6 | Cookies, coffees, and teas |
| 7 | Sodas, seltzers, and bottled waters |
| 8 | Paper towels, paper plates and cups, napkins, assorted chips, popcorn, peanuts, and pretzels |
| 9 | Bathroom tissue, books, magazines, stationary material, and trash bags |
| 10 | General health and beauty items, such as soaps, deodorants, and shampoos |
| 11 | Baby care items such as diapers and baby food, as well as medicines for colds, coughs, and other ailments |
| 12 | Dishwashing detergents, clothes detergents, bleach, mops, floor cleaners, window cleaners, and bathroom cleaners |

| | |
|----|---|
| 13 | Pet food, cat litter, and other pet care products |
| 14 | Dietary foods, cards, frozen dinners, and frozen vegetables |
| 15 | Frozen pizza, frozen breakfast foods, frozen juices, and ice creams |
| 16 | Dairy items such as milk, butter, creams, and cheeses, breads, and pastries |

This should give an idea of where items are located in the store. Later in this case study, we will concentrate on three different items from this store, and show how the UPC has helped to keep track of these items.

Figure 9: Shaw's Store Layout



3.1.1 Ordering System

The ordering system in Shaw's is unique to grocery stores in the area. It is unique in that it uses an automatic ordering system called a supervisory ordering system. No other store in the area uses an automatic ordering system. The supervisory ordering system is discussed in the next subsection. Shaw's, as well as other stores such as Stop & Shop, use a normal system of ordering, where the managers go around the store and use hand held scanners called Telzons to scan the UPCs of the items that are needed. Shaw's has four different warehouses where it receives most of its items or products, such as soup, canned corn, and cereal. It also receives products from other distributors. C&S Distributors handle the milk and ice cream that are delivered to the store. Pepsi and Coca-Cola handle the delivery and loading of their products in the store. Orders are usually sent to and received from the four warehouses and C&S every other day. An order sent in on Tuesday would be brought to the store on Wednesday, and the next ordering day would be Thursday. When a manager making out an order, notices that more canned corn is needed. He simply scans the UPC on the shelf tag for the corn, enters the corn onto the order list in the stores computer system, and types in how many cases are needed. Before the order is sent in, the manager will look in the store's database to see how well the corn had sold for that week of a year before. The manager can then adjust the amount he has to order accordingly. This is how the normal ordering system works.

Without the past sales information given by the store's database, the manager would have to guess how much canned corn was needed. The blind guessing would lead to either over ordering or under ordering the canned corn. Over ordering it will make sure the shelf is full, but also would lead to a large amount of back stock, which is undesirable. After long time money would be lost if the extra canned corn couldn't be sold before its expiration date. On

the other hand, under ordering of the canned corn would lead to an empty shelf. The company loses money because customers coming in to buy the corn would not find it in the appropriate aisle, and thereby decide to purchase the corn at another store.



Figure 10: Check out area, or POS, at Shaw's

3.1.1.1 Supervisory Ordering System

Shaw's has a system called supervisory ordering. The supervisory ordering system is an automatic ordering system that utilizes the scanners at the point of sale (POS) and the store's computer system. The cash registers (pictured in Figure 10) are equipped with scanners to read the UPCs of the store items. When an item, such as Shaw's 1-% milk is scanned at the register, the computer identifies the milk by its UPC symbol. In the computer's database is information on the milk, such as its size (one gallon), and of course, how much it costs (\$2.69). The cost is automatically added to the combined price of the other items being bought. The milk is also logged into the computer system's database as being sold. The supervisory ordering system initializes when a certain amount of items like Shaw's 1-% gallon milk has been scanned in at the cash registers. That number is known as the re-ordering point of the item. In the case of the Shaw's 1-% gallon size milk, 120 gallons has to be sold before Shaw's computer adds

another rack of 1-% milk to the next order. One rack of milk contains 120 gallons of the Shaw's 1-% gallon size milk. When the time comes to order, the items being ordered are sent to the warehouses electronically. Processing and delivering the orders takes about 1 day. The order is received at the store, and the products are either stored in their respective areas, or put up on the shelves. The process starts all over again.

The supervisory system is used in conjunction with the regular ordering method described before in Section 3.1.1. The supervisory system is used to maintain the stocks on the shelves. The main fault in the system is when an item, such as canned corn, is put onto an end display. Usually when an item is to be put on an end display, more cases of it are ordered the week before, to make sure there is enough to keep the end display filled. For instance, the canned corn on the shelf in aisle 2 could remain untouched, but several cases of it can be ordered by the supervisory system, because it can be bought in large quantities from the end display. To prevent this, the inventory manager monitors the supervisory system, correcting any wrong orders it may have made by visually confirming what is needed on the shelves. Despite this problem, the supervisory system enables the store managers to maintain stocks in the store at manageable levels.

3.1.2 Information Gathered by the UPC

The UPC can be used to help keep track of the items sold in the store. We selected three different items from the shelves of Shaw's. Using their UPCs and the store's computer database, we called up past sales information of the items, dating back to December of 1998. The information that was gathered from Shaw's computer database was put into the three tables in the appendices. Each table has listed the weekly sales, units sold per week, the price of

the items during that week, and the date the week ended. The tables were used to make the graphs in Figures 12-15, 18, and 19. The first item we considered was Shaw's 1-% gallon size milk. The milk is located in aisle 16, in the dairy section. Figure 11 is a picture a showing exactly where in aisle 16 Shaw's 1-% gallon milk is located.



Figure 11: The dairy section in aisle 16 of Shaw's

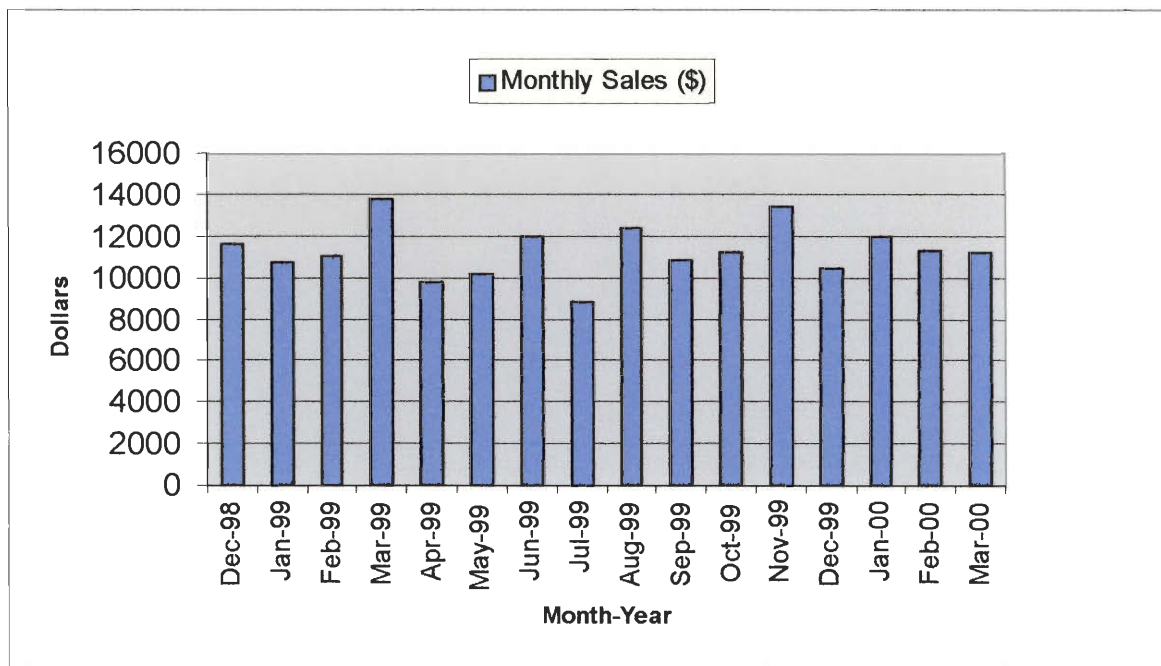


Figure 12: Graph of the sale of Shaw's 1-% Gallon Milk from December of 1998 To March of 2000 in dollars grossed per month.

In Figure 12 we have a graph of the sale of milk in terms of dollars grossed per month. As seen on the graph, the sale of Shaw's 1-% gallon milk peaks in the months of March

and November of 1999 both near \$14,000 in sales. The lowest month of sales was in the month of July in 1999, which was just over \$8,000 in sales. In comparing the months of January and February from 1999 and 2000, we observed that more milk was sold in the January and February of 2000. Looking at Figure 13, the actual amount sold per month of Shaw's 1-% gallon milk, we confirm what is shown in Figure 12. In March and November of 1999, around 5000 gallons of milk was sold in Shaw's. There was no special reason for the high amount of milk sold in these two months. By looking at Figures 12 and 13, and visually comparing them, we see they rise and fall relatively the same amount. It shows that the price of the milk stayed relatively stable through the recorded period of time. Looking at Table 2 below helps to confirm this. The numerical information in Table 2 was used to make Figures 12 and 13.

Table 2: Monthly Sales Information of Shaw's 1% Milk

| Month-Year | Amount Sold (Gallons) | Amount of Sales (\$) |
|------------|-----------------------|----------------------|
| Dec-98 | 4696 | 11568.98 |
| Jan-99 | 3989 | 10701.81 |
| Feb-99 | 3940 | 10992.6 |
| Mar-99 | 5071 | 13828.79 |
| Apr-99 | 3810 | 9793.4 |
| May-99 | 3758 | 10109.02 |
| Jun-99 | 4462 | 12002.78 |
| Jul-99 | 3272 | 8799.68 |
| Aug-99 | 4596 | 12363.24 |
| Sep-99 | 4025 | 10827.25 |
| Oct-99 | 3888 | 11203.52 |
| Nov-99 | 4974 | 13419.36 |
| Dec-99 | 4046 | 10479.14 |
| Jan-00 | 4608 | 11934.72 |
| Feb-00 | 4403 | 11332.57 |
| Mar-00 | 4521 | 11184.99 |

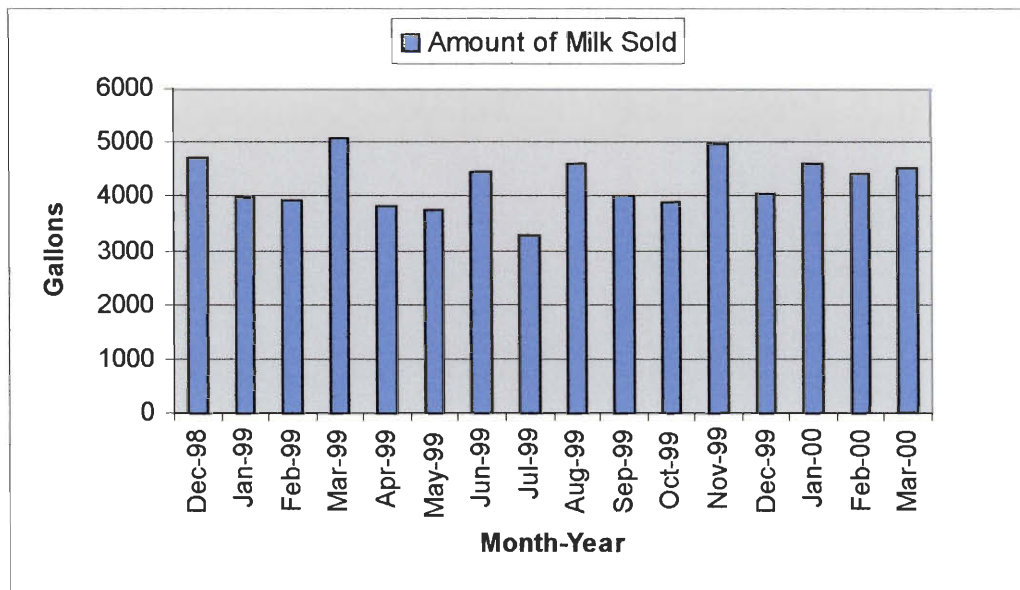


Figure 13: The Amount of Shaw's 1- Gallon size Milk sold In Gallons Per Month

The next store item we obtained sales information on was the Del Monte canned corn. Figures 14 and 15 are graphical representations of the amount of Del Monte corn sold in the store per month from December of 1998 to March of 2000. Table 3 is the summation of the data in the appendix to make Figures 14 and 15. Figure 14 represents the amount of cans of Del Monte corn sold per month in the store. The months of March and October in 1999 were when the most cans of Del Monte corn were sold. As reflected in Figure 15, this was also when the store grossed the most money from the sale of the Del Monte corn. Again, there was no particular reason given for the large amount of cans sold in those months. When the two graphs

are visually compared to each other, we see that the rise and fall of the values are relatively the same. There was relatively little up and down movement of the price of the Del Monte corn, which can be confirmed by looking at the tables in the appendices. The Del Monte corn is located with the other canned vegetables, in aisle 2. Figure 16 is a picture of where the canned vegetables are in aisle 2.

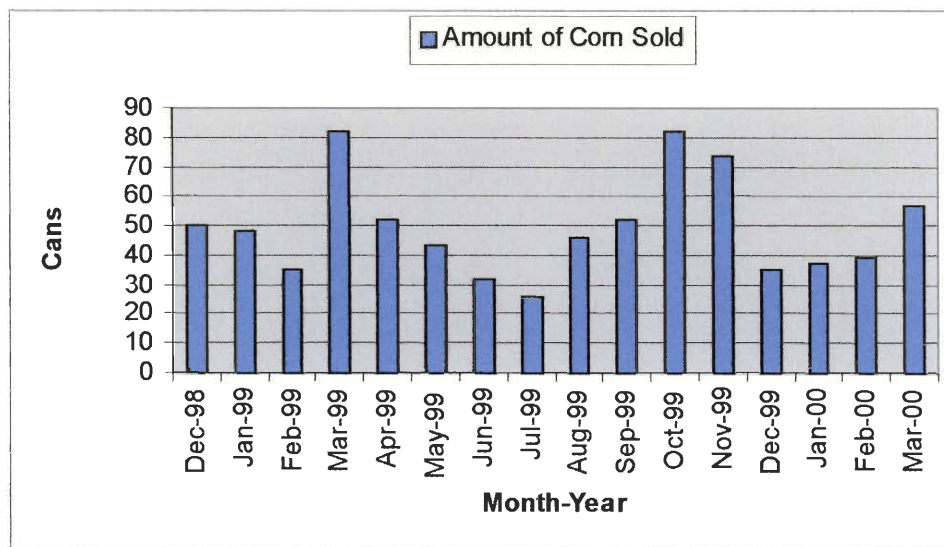


Figure 14: Amount of Cans of Del Monte Corn Sold per Month

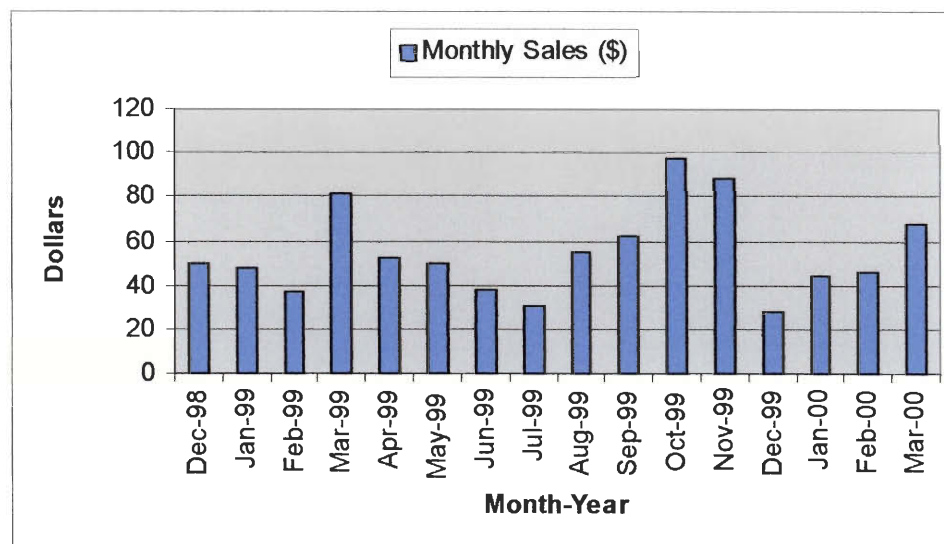


Figure 15: Sales of Del Monte Corn in Dollars per Month

Table 3: Monthly Sales Information of Del Monte Corn

| Month-Year | Amount Sold (Cans) | Amount of Sales (\$) |
|------------|--------------------|----------------------|
| Dec-98 | 50 | 49.50 |
| Jan-99 | 48 | 47.52 |
| Feb-99 | 35 | 37.35 |
| Mar-99 | 82 | 81.18 |
| Apr-99 | 52 | 52.78 |
| May-99 | 43 | 49.37 |
| Jun-99 | 32 | 38.08 |
| Jul-99 | 26 | 30.94 |
| Aug-99 | 46 | 54.74 |
| Sep-99 | 52 | 61.88 |
| Oct-99 | 82 | 97.58 |
| Nov-99 | 74 | 88.06 |
| Dec-99 | 35 | 27.85 |
| Jan-00 | 37 | 44.03 |
| Feb-00 | 39 | 46.41 |
| Mar-00 | 57 | 67.83 |

**Figure 16: Canned vegetable section in aisle 2 of Shaw's**

The third and final item from the store we document information on is Breyer Natural Vanilla ice cream in the half-gallon containers. The ice cream is located in aisle 15 of Shaw's, towards the front of the store. Figure 17 is a picture of the ice cream section in the aisle. The picture helps to visualize where in the store the Breyer Natural Vanilla ice cream is located.



Figure 17: Ice Cream section in aisle 15 of Shaw's

Figures 18 and 19 display the sales information of the Breyer Natural Vanilla ice cream. On both graphs, the most Breyer ice cream is sold in the month of June in 1999. Table 4 shows the numerical information used to make Figures 18 and 19. Shaw's grossed just over \$1000 and sold near 350 half-gallon containers of Breyer Natural Vanilla ice cream. The large amount of ice cream sold is not too unusual since June is the beginning of summer. Many people were looking for something cold to eat in the beginning of the summer, so they bought a large quantity of ice cream. According to the prices for the weeks of June 2000, listed in the tables in the appendices, the ice cream was one sale for most of the month. When we compare the two graphs together, we notice that the graphs do not relatively match up. In Figure 18, the physical amount of Breyer ice cream sold in the months of September and December of 1999, and January of 2000 is the same. Looking at the same months in Figure 19, we see that the money made from those sales is not the same. Slightly more money is made in December of 1999 than in the other two months. This is an indication of a higher selling price for Breyer Natural Vanilla in December of 1999. Looking at the tables in the appendices, we confirm this by seeing that the Breyer Natural Vanilla was on sale for most of the month of January 2000. Another difference

in price can be seen when comparing the months of August and September in 1999. In Figure 18, it is shown that more containers of ice cream are sold in September. When we look at the same months in Figure 19 however, more money is made in August than in September, again indicating a higher price for the ice cream. Consulting the tables in the appendices, we see that in the week ending of October 2, 1999 and the last week of September, it was on sale for 2 for \$4.59. A lot of Breyer Natural Vanilla was sold this week at that low price. This is the main reason less money was made in September of 1999 than in August of 1999.

Table 4: Sales Information of Breyer's Vanilla Ice Cream

| Month-Year | Amount Sold (Half gallons) | Amount of Sales (\$) |
|------------|----------------------------|----------------------|
| Dec-98 | 77 | 345.73 |
| Jan-99 | 191 | 527.25 |
| Feb-99 | 46 | 186.64 |
| Mar-99 | 120 | 433.80 |
| Apr-99 | 125 | 435.25 |
| May-99 | 148 | 525.72 |
| Jun-99 | 347 | 1065.61 |
| Jul-99 | 85 | 388.55 |
| Aug-99 | 216 | 775.44 |
| Sep-99 | 229 | 665.55 |
| Oct-99 | 88 | 403.92 |
| Nov-99 | 138 | 633.42 |
| Dec-99 | 231 | 757.35 |
| Jan-00 | 233 | 703.72 |
| Feb-00 | 217 | 642.82 |
| Mar-00 | 86 | 394.74 |

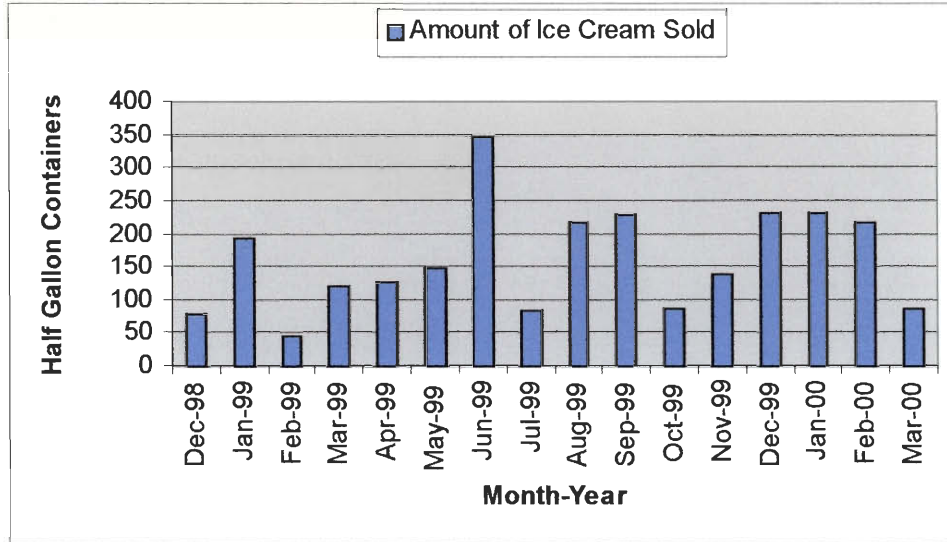


Figure 18: Amount of containers of Breyer Vanilla Ice Cream Sold per Month

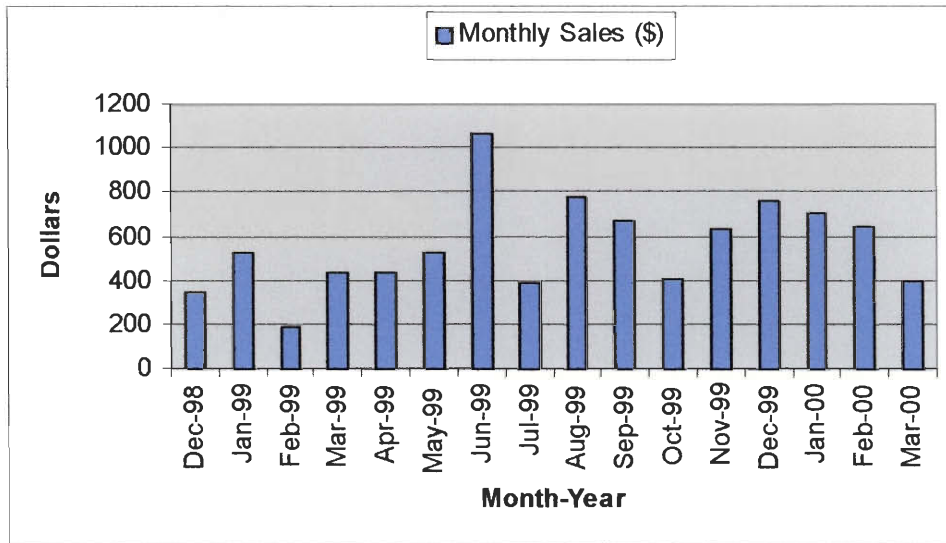


Figure 19: Amount of Money Grossed from the Sale of Breyer Ice Cream per Month

The sale information on the Breyer Natural Vanilla ice cream, the Del Monte corn and the Shaw’s 1-% gallon size milk, and other items in the store are gathered using the UPC and Shaw’s computer database. Every item that gets scanned at the point of sale is logged into the computer database of the store. Without the UPC, the amount of ice cream or canned corn sold

by the store would have to be guessed by looking at several factors. What is left on the shelves, how much comes in with the load, how much is left in the back of the store, and how much is damaged are the factors that would be looked at by the managers. They would not be able to account for how much ice cream or canned corn may have been stolen. With the UPC and the computer database in the store, all the guessed work of how much is sold is taken away. The managers get accurate values of how much the store is selling canned corn, ice cream, or other items.

Knowing exactly how much is sold in the store can help managers see if items are being stolen from the store or not. For example, let us say that only three cans of Del Monte corn are sold over the period of a week. The computer database would confirm that only three cans are sold in the store. But a manager making out an order notices that the shelf space for the Del Monte corn is nearly empty. Seeing this the manager can come to two possible conclusions. The first possible conclusion is that the many of the cans of the corn have been both returned and voided out of the computer system. To check on this, the manager can check the return area, and make a visual count of any returned canned corn. After checking the return area, the manager sees that no cans of Del Monte corn have been returned. This would bring the manager to his second possible conclusion, that someone has been stealing the corn from the store. The manager can now inform the rest of the employees and other managers to watch for anyone who may be shoplifting from the store. This is just an example of how the UPC and the store's computer database can help inform the managers if items are being stolen. In the section, we examine the role of bar coding in US Postal Service.

3.2 The United States Postal Service

Through the use of the Postnet symbol and other bar codes, the U.S. Postal Service has improved its performance greatly. The sorting and tracking of mail has been made simpler and more efficient by bar coding. The Postnet bar code, mentioned earlier, is a numeric bar code. It contains the zip code of the address the mail is being sent to, and a four-digit address code. The address code is a number given to a specific address. For example, a letter being sent to the address, PO Box 555, Nantucket, MA 02554 would have Postnet symbol encoding 02554-0555. The last four numbers are for the specific address, PO Box 555 in the zip code 02554. Having this encoded into the Postnet symbol on any type of mail being sent through the U.S. Postal Service allows easy sorting of mail. Sorting machines can read the Postnet symbol and automatically sort out the mail by address. Using this system, 25,000 pieces of mail can be sorted by the machines in an hour, rather than the 600-700 pieces an hour done by hand. For mail that do not have the Postnet code printed on them, special machines were developed to read the addresses on the letters, and print the appropriate zip code and address code in Postnet form onto the letters. It is then sent to the sorting machine to be scanned and sorted. The Post Office gives discounts on the postage of companies who send mass mailings with the Postnet code already printed onto the letters. One example of this would be all the junk mail one receives in the mail. The companies that send junk mail print the Postnet codes on the mail they send, giving them a discount on the postage they have to pay.

The Postal Service also uses other bar codes to track important mail, such as priority mail and mail with confirmed delivery. Priority mail uses a Code 39 symbol to encode a 13-character code. The code starts and stops with a total of four alpha characters, with nine numeric characters in the middle. The purpose of the code is to enable the Post Service to track

the priority mail. It is scanned at every post office on its way to its final destination. This allows people who want to know if a letter or package being sent priority is on its way, if its been delayed, or if it has arrived, all by knowing the number encoded in the bar code. The other system of bar coding used by the Postal Service is a two-dimensional symbology, which encodes twenty numeric characters. The number encoded by the symbol is used in confirming that a letter or package has been delivered. For example, a woman sends her daughter an important letter. To make sure it is delivered, she has a confirmed delivery code placed on it and writes down the number it encodes. Now all she has to do to check up on the letter is to either go to the Postal Services' web site and enter the number, or bring the number to her local post office and seeks information on it. In either case, she can confirm if the letter has been delivered, or if an attempted delivery has been made. When an attempted delivery has been made, the code is scanned by a postal worker, and is entered into the computer as attempted delivery. When the letter is successfully delivered, it is first scanned in as a successful delivery, and then given to the person it has been sent.

Other systems of bar coding are being introduced into the Post Office. As of right now it is unclear what they will be assigned for, but it is known that the main plan is to make every possible aspect of mailing automated and easy to track. For the moment, only important mail items and packages are tagged with tracking numbers. All other mail has the Postnet code printed on them to ensure swift and easy mail sorting and delivery.

Chapter IV. Conclusion

4. Conclusion

Bar coding in its many different symbologies has improved the tracking of many different products. Codabar has improved the tracking of books in libraries and blood collected for hospitals. The UPC keeps track of items sold in grocery and retail stores. Before bar codes were introduced to these areas, everything was tracked by handwriting what was checked out, what was stored, and what needed to be ordered. Keeping handwritten records of items and products requires hiring extra personnel just to keep track of them all. The introduction of bar codes and improvements in computers minimized the amount of workers to keep track of the items. The computers through using bar codes keep track of the bar-coded items.

Shaw's supermarket using the UPC bar code symbology to keep track of its sales is an example of how bar codes have improved the store's operations. Milk and eggs are quickly scanned at the cash registers, automatically adding them to the customer's receipt, making purchasing them faster. The cash registers also add them to the computer database in the store as a sold item. Using the information gathered from the cash registers, the managers have an easier time of ordering. By looking at the sale information from a year ago managers can make educated guesses as to how much of a particular item, like milk, is needed. With a computer keeping track of the items sold from the store, less people are needed to keep track of Shaw's inventory.

The future of bar coding is very bright. With the explosion of e-commerce, or selling items over the Internet, bar codes are going to be utilized in helping these new online businesses. E-businesses like Amazon.com™ have their items stored in vast warehouses. When a

customer places an order for a book, like *Jaws* by Peter Benchley, the computer database in the warehouse identifies the book and tells workers where it is located. This would not be possible if the book itself did not have a UPC system on its outer cover. Without it, the book would not have been scanned into the database, and information on it would be harder to obtain. Indeed, as long as the need to keep track of individual goods in large quantities is strong, bar codes in all of its forms will be utilized to make life easier for the future.

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Appendix

Table 5: Sale Information on Shaw's 1% Gallon Size Milk

UPC: 04567434905 R.O.P.: 120
 Description: Shaw's 1% Milk Pack Size: 120
 Shelf Capacity: 240 Facings: 24

| Date the week ends | Sales for the week (\$) | Amount of units sold (Gallons of milk) | Price (\$) |
|--------------------|-------------------------|---|------------|
| December 5, 1998 | 1656.27 | 693 | 2.39 |
| December 12, 1998 | 2393.61 | 981 | 2.45 |
| December 19, 1998 | 2501.75 | 1007 | 2.49 |
| December 26, 1998 | 2280.84 | 916 | 2.49 |
| January 2, 1999 | 2736.51 | 1099 | 2.49 |
| January 9, 1999 | 2502.45 | 1005 | 2.49 |
| January 16, 1999 | 2616.57 | 983 | 2.79 |
| January 23, 1999 | 2876.49 | 1031 | 2.79 |
| January 30, 1999 | 2706.30 | 970 | 2.79 |
| February 6, 1999 | 2764.89 | 991 | 2.79 |
| February 13, 1999 | 2834.64 | 1016 | 2.79 |
| February 20, 1999 | 2497.05 | 895 | 2.79 |
| February 27, 1999 | 2896.02 | 1038 | 2.79 |
| March 6, 1999 | 2843.01 | 1019 | 2.79 |
| March 13, 1999 | 2638.71 | 949 | 2.69 |
| March 20, 1999 | 2802.98 | 1042 | 2.69 |
| March 27, 1999 | 2735.73 | 1017 | 2.69 |
| April 3, 1999 | 2808.36 | 1044 | 2.69 |
| April 10, 1999 | 1995.09 | 911 | 2.19 |
| April 17, 1999 | 2628.13 | 977 | 2.69 |
| April 24, 1999 | 2345.68 | 872 | 2.69 |
| May 1, 1999 | 2824.50 | 1050 | 2.69 |
| May 8, 1999 | 2719.59 | 1011 | 2.69 |
| May 15, 1999 | 2095.51 | 779 | 2.69 |
| May 22, 1999 | 2644.27 | 983 | 2.69 |
| May 29, 1999 | 2649.65 | 985 | 2.69 |
| June 5, 1999 | 2383.34 | 886 | 2.69 |
| June 12, 1999 | 2391.41 | 889 | 2.69 |
| June 19, 1999 | 2313.40 | 860 | 2.69 |
| June 26, 1999 | 2418.31 | 899 | 2.69 |
| July 3, 1999 | 2496.32 | 928 | 2.69 |
| July 10, 1999 | 2106.27 | 783 | 2.69 |
| July 17, 1999 | 2377.96 | 884 | 2.69 |
| July 24, 1999 | 2278.43 | 847 | 2.69 |
| July 31, 1999 | 2037.02 | 758 | 2.69 |

| | | | |
|--------------------|---------|------|------|
| August 7, 1999 | 2240.77 | 833 | 2.69 |
| August 14, 1999 | 2348.37 | 873 | 2.69 |
| August 21, 1999 | 2587.78 | 962 | 2.69 |
| August 28, 1999 | 2488.25 | 925 | 2.69 |
| September 4, 1999 | 2698.07 | 1003 | 2.69 |
| September 11, 1999 | 2523.22 | 938 | 2.69 |
| September 18, 1999 | 2816.43 | 1047 | 2.69 |
| September 25, 1999 | 2773.39 | 1031 | 2.69 |
| October 2, 1999 | 2714.21 | 1009 | 2.69 |
| October 9, 1999 | 2874.54 | 1006 | 2.89 |
| October 16, 1999 | 2788.85 | 965 | 2.89 |
| October 23, 1999 | 2725.27 | 943 | 2.89 |
| October 30, 1999 | 2814.86 | 974 | 2.89 |
| November 6, 1999 | 2866.88 | 992 | 2.89 |
| November 13, 1999 | 2697.01 | 949 | 2.59 |
| November 20, 1999 | 2514.89 | 971 | 2.59 |
| November 27, 1999 | 2631.44 | 1016 | 2.59 |
| December 4, 1999 | 2709.14 | 1046 | 2.59 |
| December 11, 1999 | 2696.19 | 1041 | 2.59 |
| December 18, 1999 | 2408.70 | 930 | 2.59 |
| December 25, 1999 | 2496.76 | 964 | 2.59 |
| January 1, 2000 | 2877.49 | 1111 | 2.59 |
| January 8, 2000 | 2802.38 | 1082 | 2.59 |
| January 15, 2000 | 2957.78 | 1142 | 2.59 |
| January 22, 2000 | 3110.59 | 1201 | 2.59 |
| January 29, 2000 | 3063.97 | 1183 | 2.59 |
| February 5, 2000 | 2841.23 | 1097 | 2.59 |
| February 12, 2000 | 2877.49 | 1111 | 2.59 |
| February 19, 2000 | 3053.61 | 1179 | 2.59 |
| February 26, 2000 | 2560.24 | 1016 | 2.19 |
| March 4, 2000 | 2871.09 | 1311 | 2.19 |
| March 11, 2000 | 2538.20 | 980 | 2.59 |
| March 18, 2000 | 2900.80 | 1120 | 2.59 |
| March 25, 2000 | 2874.90 | 1110 | 2.59 |

Table 6: Sale Information on Del Monte Canned Corn

| | | | |
|-----------------|-----------------------------|------------|----|
| UPC: | 02400002771 | R.O.P.: | 14 |
| Description: | Del Monte Gold & White Corn | Pack Size: | 12 |
| Shelf Capacity: | 26 | Facings: | 2 |

| Date the week ends | Sales for the week (\$) | Amount of units sold (Cans of corn) | Price (\$) |
|--------------------|-------------------------|--|------------|
| December 5, 1998 | 11.88 | 12 | 0.99 |
| December 12, 1998 | 9.90 | 10 | 0.99 |
| December 19, 1998 | 4.95 | 5 | 0.99 |
| December 26, 1998 | 7.92 | 8 | 0.99 |
| January 2, 1999 | 14.85 | 15 | 0.99 |
| January 9, 1999 | 12.87 | 13 | 0.99 |
| January 16, 1999 | 13.86 | 14 | 0.99 |
| January 23, 1999 | 10.89 | 11 | 0.99 |
| January 30, 1999 | 9.90 | 10 | 0.99 |
| February 6, 1999 | 10.40 | 10 | 1.09 |
| February 13, 1999 | 7.63 | 7 | 1.09 |
| February 20, 1999 | 11.99 | 11 | 1.09 |
| February 27, 1999 | 7.33 | 7 | 0.99 |
| March 6, 1999 | 13.86 | 14 | 0.99 |
| March 13, 1999 | 15.84 | 16 | 0.99 |
| March 20, 1999 | 18.81 | 19 | 0.99 |
| March 27, 1999 | 17.82 | 18 | 0.99 |
| April 3, 1999 | 14.85 | 15 | 0.99 |
| April 10, 1999 | 12.87 | 13 | 0.99 |
| April 17, 1999 | 18.81 | 19 | 0.99 |
| April 24, 1999 | 14.56 | 14 | 1.09 |
| May 1, 1999 | 6.54 | 6 | 1.09 |
| May 8, 1999 | 16.35 | 15 | 1.09 |
| May 15, 1999 | 6.84 | 6 | 1.19 |
| May 22, 1999 | 11.90 | 10 | 1.19 |
| May 29, 1999 | 14.28 | 12 | 1.19 |
| June 5, 1999 | 10.71 | 9 | 1.19 |
| June 12, 1999 | 3.57 | 3 | 1.19 |
| June 19, 1999 | 9.52 | 8 | 1.19 |
| June 26, 1999 | 9.52 | 8 | 1.19 |
| July 3, 1999 | 4.76 | 4 | 1.19 |
| July 10, 1999 | 7.14 | 6 | 1.19 |
| July 17, 1999 | 4.76 | 4 | 1.19 |
| July 24, 1999 | 13.09 | 11 | 1.19 |
| July 31, 1999 | 5.95 | 5 | 1.19 |

| | | | |
|--------------------|-------|----|------|
| August 7, 1999 | 10.71 | 9 | 1.19 |
| August 14, 1999 | 15.47 | 13 | 1.19 |
| August 21, 1999 | 8.33 | 7 | 1.19 |
| August 28, 1999 | 8.33 | 7 | 1.19 |
| September 4, 1999 | 11.90 | 10 | 1.19 |
| September 11, 1999 | 14.28 | 12 | 1.19 |
| September 18, 1999 | 20.23 | 17 | 1.19 |
| September 25, 1999 | 11.90 | 10 | 1.19 |
| October 2, 1999 | 15.47 | 13 | 1.19 |
| October 9, 1999 | 26.18 | 22 | 1.19 |
| October 16, 1999 | 22.61 | 19 | 1.19 |
| October 23, 1999 | 33.32 | 28 | 1.19 |
| October 30, 1999 | 15.47 | 13 | 1.19 |
| November 6, 1999 | 14.28 | 12 | 1.19 |
| November 13, 1999 | 32.13 | 27 | 1.19 |
| November 20, 1999 | 15.47 | 13 | 1.19 |
| November 27, 1999 | 16.66 | 14 | 1.19 |
| December 4, 1999 | 9.52 | 8 | 1.19 |
| December 11, 1999 | 10.71 | 9 | 1.19 |
| December 18, 1999 | 4.00 | 8 | 0.50 |
| December 25, 1999 | 4.50 | 9 | 0.50 |
| January 1, 2000 | 8.64 | 9 | 1.19 |
| January 8, 2000 | 11.90 | 10 | 1.19 |
| January 15, 2000 | 14.28 | 12 | 1.19 |
| January 22, 2000 | 8.33 | 7 | 1.19 |
| January 29, 2000 | 9.52 | 8 | 1.19 |
| February 5, 2000 | 11.90 | 10 | 1.19 |
| February 12, 2000 | 11.90 | 10 | 1.19 |
| February 19, 2000 | 10.71 | 9 | 1.19 |
| February 26, 2000 | 11.90 | 10 | 1.19 |
| March 4, 2000 | 16.66 | 14 | 1.19 |
| March 11, 2000 | 13.09 | 11 | 1.19 |
| March 18, 2000 | 20.23 | 17 | 1.19 |
| March 25, 2000 | 17.85 | 15 | 1.19 |

Table 7: Sale Information on Breyer Vanilla Ice Cream

UPC: 07756725423 R.O.P.: 24
 Description: Breyer Natural Vanilla Ice Cream Pack Size: 6
 Shelf Capacity: 30 Facings: 3

| Date the week ends | Sales for the week (\$) | Amount of units sold (half gallons of ice cream) | Price (\$) |
|--------------------|-------------------------|---|------------|
| December 5, 1998 | 58.37 | 13 | 4.49 |
| December 12, 1998 | 62.86 | 14 | 4.49 |
| December 19, 1998 | 71.84 | 16 | 4.49 |
| December 26, 1998 | 112.25 | 25 | 4.49 |
| January 2, 1999 | 40.41 | 9 | 4.49 |
| January 9, 1999 | 53.88 | 12 | 4.49 |
| January 16, 1999 | 65.87 | 16 | 2.50 |
| January 23, 1999 | 90.00 | 36 | 2.50 |
| January 30, 1999 | 317.50 | 127 | 2.50 |
| February 6, 1999 | 51.94 | 16 | 4.49 |
| February 13, 1999 | 53.88 | 12 | 4.49 |
| February 20, 1999 | 53.88 | 12 | 4.49 |
| February 27, 1999 | 26.94 | 6 | 4.49 |
| March 6, 1999 | 35.92 | 8 | 4.49 |
| March 13, 1999 | 67.35 | 15 | 4.49 |
| March 20, 1999 | 70.33 | 17 | 2.99 |
| March 27, 1999 | 197.34 | 66 | 2.99 |
| April 3, 1999 | 62.86 | 14 | 4.49 |
| April 10, 1999 | 52.37 | 13 | 2.99 |
| April 17, 1999 | 245.18 | 82 | 2.99 |
| April 24, 1999 | 91.80 | 20 | 4.59 |
| May 1, 1999 | 45.90 | 10 | 4.59 |
| May 8, 1999 | 68.85 | 15 | 4.59 |
| May 15, 1999 | 269.10 | 90 | 4.59 |
| May 22, 1999 | 105.57 | 23 | 4.59 |
| May 29, 1999 | 82.20 | 20 | 2.99 |
| June 5, 1999 | 328.90 | 110 | 2.99 |
| June 12, 1999 | 91.80 | 20 | 4.59 |
| June 19, 1999 | 105.12 | 27 | 2.50 |
| June 26, 1999 | 397.50 | 159 | 2.50 |
| July 3, 1999 | 142.29 | 31 | 4.59 |
| July 10, 1999 | 91.80 | 20 | 4.59 |
| July 17, 1999 | 100.98 | 22 | 4.59 |
| July 24, 1999 | 114.75 | 25 | 4.59 |
| July 31, 1999 | 81.02 | 18 | 2.99 |

| | | | |
|--------------------|--------|-----|------------|
| August 7, 1999 | 403.65 | 135 | 2.99 |
| August 14, 1999 | 123.93 | 27 | 4.59 |
| August 21, 1999 | 105.57 | 23 | 4.59 |
| August 28, 1999 | 73.44 | 16 | 4.59 |
| September 4, 1999 | 68.85 | 15 | 4.59 |
| September 11, 1999 | 78.03 | 17 | 4.59 |
| September 18, 1999 | 73.44 | 16 | 4.59 |
| September 25, 1999 | 59.67 | 13 | 4.59 |
| October 2, 1999 | 454.41 | 183 | 2 for 4.59 |
| October 9, 1999 | 142.29 | 31 | 4.59 |
| October 16, 1999 | 119.34 | 26 | 4.59 |
| October 23, 1999 | 68.85 | 15 | 4.59 |
| October 30, 1999 | 73.44 | 16 | 4.59 |
| November 6, 1999 | 100.98 | 22 | 4.59 |
| November 13, 1999 | 82.62 | 18 | 4.59 |
| November 20, 1999 | 114.75 | 25 | 4.59 |
| November 27, 1999 | 215.73 | 47 | 4.59 |
| December 4, 1999 | 119.34 | 26 | 4.59 |
| December 11, 1999 | 100.98 | 22 | 4.59 |
| December 18, 1999 | 119.34 | 26 | 4.59 |
| December 25, 1999 | 188.19 | 41 | 4.59 |
| January 1, 2000 | 348.84 | 142 | 2 for 4.59 |
| January 8, 2000 | 78.03 | 17 | 4.59 |
| January 15, 2000 | 98.85 | 27 | 2.50 |
| January 22, 2000 | 407.50 | 163 | 2.50 |
| January 29, 2000 | 119.34 | 26 | 4.59 |
| February 5, 2000 | 107.21 | 27 | 2.50 |
| February 12, 2000 | 402.50 | 161 | 2.50 |
| February 19, 2000 | 68.85 | 15 | 4.59 |
| February 26, 2000 | 64.26 | 14 | 4.59 |
| March 4, 2000 | 55.08 | 12 | 4.59 |
| March 11, 2000 | 114.75 | 25 | 4.59 |
| March 18, 2000 | 114.75 | 25 | 4.59 |
| March 25, 2000 | 110.16 | 24 | 4.59 |