"BARCODE TECHNOLOGY"

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Abstract— A barcode is a machine-readable strip of data printed in parallel lines, used to represent a multitude of information. Traditionally, a barcode scanner is used by retailers to keep track of inventory and speed up data entry. Due to their Heavy commercial and industrial sector usage, barcode scanning applications have been producer-centric, focusingon improving the efficiency, accuracy, and productivity of supply management.

Introduction-

In 1930 the grocery industry was growing at rapid pace. With this growth there was a need to have an accurate tracking system for inventory. In 1948 a supermarket executive came to Drexel University to asking the dean of engineering if the university could determine how to capture product information automatically at checkout. The dean turned down the request but this university graduate student Bernard Silver was interested to solve this problem. He was talk with another fellow student Norman Joseph Woodland for making a solution in this case. Then they started working on some preliminary ideas, Woodland was persuaded that they could create a viable product.

Woodland took some stock market earnings, quit his teaching job and moved to his grandfather apartment. While at the beach woodland again considered the problem, recalling, from his Boy Scout training, how Morse code dots and dashes are used to send information electronically. He drew dots and dashes in the sand similar to the shapes used in Morse code. After pulling them downward with his fingers, producing thin lines resulting from the dots and thick lines from the dashes, he came up with the concept of a two-dimensional, linear Morse code, and after sharing it with Silver and adapting optical sound film technology, they applied for a patent on October 20, 1949, receiving U.S. Patent 2,612,994Classifying Apparatus and Method on October 7, 1952, covering both linear and circular bulls-eye printing designs.

Woodland was employed by IBM in 1951, and although Woodland and Silver wanted IBM to develop the technology, it wasn't commercially feasible, so they sold the patent to Philco in 1952 for $15,000, which sold it to RCA later in 1952. RCA went on to attempt to develop commercial applications through the 1960s until the patent expired in 1969.

After RCA interested the National Association of Food Chains in 1969 in the idea, and they formed the U.S. Supermarket Ad Hoc Committee on a Uniform Grocery Product Code, rival IBM became involved in 1971, finding out about Woodland's work and transferring him to their North Carolina facilities, where he played a key role in developing the most important version of the technology, the Universal Product Code (UPC), beating RCA in a competition.

The first item scanned was a packet of chewing gum in an Ohio supermarket in 1974.The first barcode was only four lines.

The first Barcode

Using of barcode—Now a day barcode is using in Books, Invoice, Products and security information, Car label.
Using barcode technology in stores can help to solve all these problems. It lets keep a centralized record on a computer system that tracks products, prices, and stock levels. Changing prices as often as you like, without having to put new price tags on all your bottles and boxes. Instantly see when stock levels of certain items are running low and reorder. Because barcode technology is so accurate, reasonably confident that any items that are missing (and don't appear to have been sold) have probably been stolen—and maybe move them to a more secure part of store or protect them with RFID tags.
A barcode-based stock system like this has three main parts. First, there's a central computer running a database (record system) that keeps a tally of all the products you're selling, who makes it, what each one costs, and how many you have in stock. Second, there are the barcodes printed on all the products. Finally, there is one or more checkout scanners that can read the barcodes.

Importance of Barcode—Barcodes are often overlooked as a method for cutting costs and saving time. A valuable and viable choice for businesses looking to improve efficiency and reduce overhead, barcodes are both cost-effective and reliable.

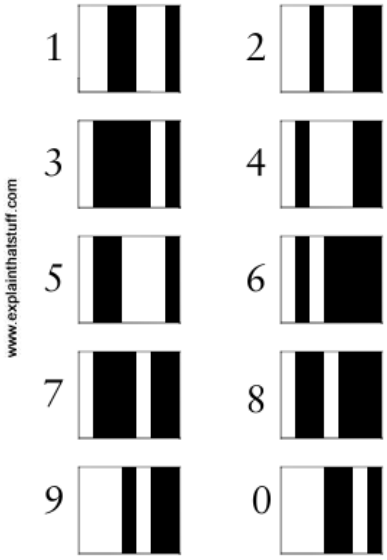
- Operating barcode system is very easy.
- The data can be scalable to business purpose or needs of organization.
- The barcode technology is improving day by day
- Barcodes can be affixed to just about any surface you need them to adhere
- Barcode is better than handwriting. Barcoding reduces human error, recognition errors and transcription errors. Handwriting is a drudgery and is susceptible to legibility problems.
- Across many industries, barcodes offer automatic product identification, extremely fast recognition and implementation of data. Which improve productivity and save time.
- Barcodes provide asset & security tracking, theft deterrence, peace of mind, and a demonstrable reduction in loss/liability
- Barcodes provide better data. Since one barcode can be used for inventory and pricing information, it is possible to quickly obtain data on both.

How Barcode represent the number

0-9—Barcode gives every item its unique number and then simply the print the number on the item so electronic scanning device can read it. If human try to print those number itself then it will easily get trouble with those decimal numbers that easy to confuse.

Each digit in the product number is given the same amount of horizontal space: exactly 7 units. Then, to represent any of the numbers from zero through nine, If it colored those seven units with a different pattern of black and white stripes. Thus, the number one is represented by coloring in two white stripes, two black stripes, two white stripes,

and one black stripe, while the number two is represented by two white stripes, one black stripe, two white stripes, and two final black stripes.

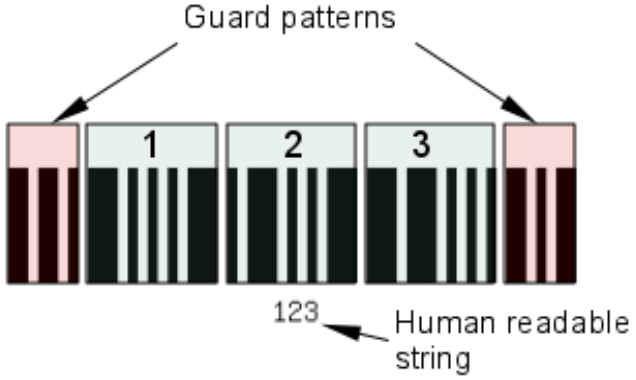


Barcodes can be quite long and that's because they have to represent three different types of information. The first part of a barcode tells you the country where it was issued. The next part reveals the manufacturer of the product. The final part of the barcode identifies the product itself. Different types of the same basic product (for example, four-packs of Coca-Cola bottles and six-packs of Coca-Cola cans) have totally different barcode numbers.

How does One Dimensional Barcode Work— Linear barcodes are created by translating the supported characters that should be displayed into combination of narrow and wide bars which are combined into a barcode. To identify the start and end of a barcode special "guard" patterns are used to indicate to the scanner that the barcode starts and also identify what type of symbology is used.

Code 25: Code 25 is a very simple numeric code which is able todisplay digits from 0 to 9. The code is primary used inindustry and is also known as Code 2 of 5 or Code 25Industrial. Code 25 has no built in check digit. The codeis some years old and it takes up so much space thattoday it is not often used.

The advantage of Code 25Interleaved is that the code uses self−checking and it isvery compact so it does not need much space like thesimple Code 25. Code 25 Interleaved is only valid ifthere is a even number of digits. To display an oddnumber of digits you have to add a zero to thebeginning (123 becomes 0123) or you may use yourown check digit.



Understanding Linear barcode or 1D barcodes

Code25 is easy to understand and each character is encoded with 5 black elements with spaces in between, 2 wide and three narrow elements, hence the name 2 of 5 (or 25). The width of the thinnest element is also known as the module width. Other symbolizes have more complicated patterns to achieve higher density (more encoded characters in a given width) but the principle still stands.

The human readable string, usually at the bottom of the barcode is strictly speaking not a part of the barcode. It is only there to help a human reader interpret the barcode.

Some barcode symbolizes also add a check digit at the end of the data. This check digit (or digits) is used to verify that the interpreted data has been read correctly.

About 2D Barcodes—Two-dimensional (2D) barcodes provide a means of embedding Web addresses, text or otherdata in a camera-readable format. This enables users of modern mobile phones to scan a 2Dbarcode with their form and be

automatically directed to a Web page or other data containedwithin the code. This simplifies having to remember or re-key URLs to Web pages on printed orother physical collateral.

2D Barcode; google.com is encoded in QR Code

Advantage of 2D Barcodes—

a. 2D barcodes allow for significant data storage (almost 7000 characters/7 KB), which could allow companies to keep a track of the raw materials going into the final product down to the last details

b. The ability for 2D barcodes to store immense amounts of data allows them to be used as an authentication and privacy devices in many sensitive supply chains.

c. 2D barcodes and their easy readability allows for them to be used by producers to connect with end-users.

d. 2D barcodes are extremely easy to use. They can be read from any direction and can be read even if they are damaged, making them especially useful for processes where the items being tagged are small or go through messy manufacturing processes.

Types of 2D Barcodes—Generelly 2D barcodes is divided into two groups.

1. Stacked 2D Barcodes
2. Matrix 2D Barcodes

Types of Barcode readers—There are four primary types of barcode readers that are each designed to fulfill specific information needs.

- **Pen:** Pen barcode readers resemble small wand-type sticks that resemble a small pen. The pen-style barcode reader consists of an LED light and a photodiode in its tip. The user passes this tip over a barcode and the LED light illuminates the black and white bars. The photodiode measures the reflection of light and is able to determine width and color (white or black) of each bar. This information allows for a digital reading of the barcode, and information is transmitted to another unit for processing.

- **Laser:** More advanced than a pen scanner, a laser barcode scanner is capable of more exact light readings which prevent false positives or scanner errors. In a laser scanner, a laser beam is shot at a mirror inside the actual unit. This mirror makes a movement so that the laser sweeps across the barcode in a straight line. This light then reflects back to a diode, which measures the level of reflection. This reflection is translated into a digital signal readout of the barcode. Laser scanners can either be mounted in a scanning unit or be part of a handheld unit.

- **CCD:**A charge coupled device (CCD), also known as an LED scanner, features hundreds of tiny LED lights arranged in one long row. These lights are shot directly onto a barcode, and a sensor then measures not the reflection, but voltage of the ambient light directly in front of each lightbulb. This voltage measurement provides a digital snapshot of the barcode. CCD units can be very expensive, but are highly accurate and versatile pieces of equipment.

- **2D Camera:**Some barcodes do not consist of white and black bars, but white and black spaces in a two-dimensional (2D) target. These 2D barcodes cannot be read by standard machinery, but they do allow for versatility of information coding as they can hold and provide much more data than a standard barcode. To read these barcodes, a 2D camera image scanner is necessary. This camera consists of hundreds of tiny lights like the CCD scanner, but these are arranged in multiple rows. The lights flash onto the barcode and take a digital picture of the barcode, which is then sent to software as a digital signal. The software then decodes the information.

Future of Barcode Technology—The barcode technology is growing day by day. It becomes more better and using scope of barcode is becoming popular day by day. Barcodes are in many ways provides help too many industry and also benefits them a lot.

Age verification: For businesses that are age restrictions (restaurant, bars, theaters, etc.) can use barcode on a customer's driver's license which can be scanned to confirm a customer's age and avoid legal problems.

Opening customer accounts: By scanning barcodes of a customer's driver's license, a retailer can collect information to open a customer account or fill out a credit application very easily.

Business Tracking: Barcode system reduces manual data entry to manage record by providing automatic process of data entry through machine.

Product Stock control: Barcode technology facilitates users to control product stock and gives accurate information of product stock detail for reordering.

Coupons: Retailers can email or text customers a coupon with a QR code that can be scanned at the time of sale from the phone screen. Coupons can be tracked so easily by using a unique code for each customer and promotion.

Tickets: You can eliminate the need for printed tickets by sending customers an electronic ticket that can be scanned off a phone screen. This also reduces the possibility of ticket fraud.

Fraud detection: In futures barcodes can be used for detecting fraud by scanning all the relevant information. Authorization: The barcodes presents on the license can also used to provide the authorization of something.

Quality measurement: Barcodes presents on a product can be used to provide the quality factor of it.

CONCLUSION

With this growth there was a need to have an accurate tracking system for inventory. In 1948 a supermarket executive came to Drexel University to asking the dean of engineering if the university could determine how to capture product information automatically at checkout. The dean turned down the request but this university graduate student Bernard Silver was interested to solve this problem. He was talk with another fellow student Norman Joseph Woodland for making a solution in this case. Then they started working on some

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ACKNOWLEDGEMENT—A **barcode** (also **bar code**) is a visual, machine-readable representation of data; the data usually describes something about the object that carries the barcode. Traditional barcodes systematically represent data by varying the widths and spacings of parallel lines, and may be referred to as linear or one-dimensional (1D). Later, two-dimensional (2D) variants were developed, using rectangles, dots, hexagons and other geometric patterns, called *matrix codes* or *2D barcodes*, although they do not use bars as such. Initially, barcodes were only scanned by special optical scanners called barcode readers. Later application software became available for devices that could read images, such as smartphones with cameras.

The barcode was invented by Norman Joseph Woodland and Bernard Silver and patented in the US in 1952 (US Patent 2,612,994). The invention was based on Morse code that was extended to thin and thick bars. However, it took over twenty years before this invention became commercially successful. An early use of one type of barcode in an industrial context was sponsored by the Association of American Railroads in the late 1960s. Developed by General Telephone and Electronics (GTE) and called KarTrak ACI (Automatic Car Identification), this scheme involved placing colored stripes in various combinations on steel plates which were affixed to the sides of railroad rolling stock. Two plates were used per car, one on each side, with the arrangement of the colored stripes encoding information such as ownership, type of equipment, and identification number.[1]The plates were read by a trackside scanner, located for instance, at the entrance to a classification yard, while the car was moving past.[2] The project was abandoned after about ten years because the system proved unreliable after long-term

References

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