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QUICK RESPONSE CODES: REVAMPING OF TECHNOLOGY CONNECTING THE REAL WORLD TO DIGITAL EFFORTLESSLY

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***Abstract*— This paper investigates the innovation that associated this present reality to the computerized with a single tick and made our lives easy. QR codes made lives simpler with a remote sensor framework that checks the information, holds the information, and offers the information with no time, which has a high clear and putting away limit. The quantitative paper comprises of the thought, history of the codes which transformed us. It likewise has an investigation of the creating innovation in the grid codes that are attempting to be more made sure about and simpler. The presentation contains the importance of the standardized tags, QR codes, and their set of experiences. Different comes the survey which gives the total guide of innovation which has the two points of interest and detriments. In an investigation, I discovered that developing advancements are making progress toward patching up on the planet. The discoveries furnished the chance of being acquainted with the developing innovation around and furthermore improved renditions of them.**

Keywords— **Bar codes, QR codes, Snap tag, NFC, RFID, advantages, and disadvantages.**

I. INTRODUCTION

Like the development of many technologies in the world, this new technology called bar codes and QR codes are invented out of necessity. Before they came into usage, manual work, time, the effort had been used a lot. After being invented, it made the work easier and loss in shopping centers, supermarkets, etc. reduced. This made life easier by easier usage in a busy world.

In the 1960s, Japan experienced a wave of economic growth. When supermarkets expanded from selling food items to adding in clothing and other commodities. To keep track of everything, they invented bar codes and QR codes. This decision of tracking commodities changed the world.

A. Bar codes

For more than four decades, bar codes have helped companies to work more efficiently, effortlessly, and accurately to track, and identify the variety of products, assets, etc.

Since 1932, these want to track down the groceries in supermarkets by Wallace Flint, a Harvard business student who proposes a punch-card system that is similar to the one developed for the 1890 U.S. Census. This idea never came to materialization as the system was expensive and cumbersome. In the year 1948, a graduate student from Drexel Institute name Bernard Silver overhears the president of a major food company and a dean discussing research on automatically tracking product information at the Supermarkets checkout. Silver passes what he heard to his friend, Norman Joseph Woodland. He was fascinated by the idea Woodland, begins conducting the research. In the year 1949, Woodland and Silver file for a patent describing the linear and bull's eye barcode systems. Later, in 1952, they build the first barcode reader, and also the patent for the barcode system was also granted. In 1962, Philco purchases the patent, then later was sold it to RCA. In the year 1967, the Association of American Railroads begins the usage of barcodes to ID railroad cars. This system contains blue and red reflective stripes attached to the side of the cars that are encoded by a six-digit company identifier and a four-digit car number.

In the year 1969, Computer Identics Corporation installs the first true barcode systems at General Motors and General Trading Company facilities. In 1970, The National Association of Food Chains (NAFC) establishes the Ad-Hoc Committee for U.S. Supermarkets on a Uniform Grocery-Product Code to set barcode development guidelines. RCA begins an 18-month test of a bull's eye barcode in a Kroger store in Cincinnati in the year 1972. Later in 1973, the Universal Product Code (UPC) is introduced and set the stage for barcodes to take off. In the year 1974, at a Marsh supermarket in Troy, Ohio, a pack of Wrigley's chewing gum is the first retail product sold using a barcode scanner. By 1984, 33% of grocery stores are equipped with barcode scanners.

II. HISTORY

For every few years, the small town of Troy in Miami County, Ohio celebrated a historic occasion for a few flighty weeks puts it on the world map of the grocery trade. At the times, National Cash Register, which provided the checkout equipment, was based in Ohio and Troy was also the

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headquarters of the Hobart Corporation, which enlarged the weighing and pricing machines loose items such as meat. It was just after 8 a.m. on June 26, 1974, that was the first item marked with the Universal Product Code (UPC), and scanned at the checkout of Troy's Marsh Supermarket.

It was treated as ceremonial occasion and involved a little bit of formality. The night before, a team of Marsh staff moved in to put bar codes on hundreds of products in the store while National Cash Register installed their scanners and computers in them. The first "shopper" was Clyde Dawson, who was the head of research and development of Marsh Supermarket; the pioneer cashier who "served" him was Sharon Buchanan. Legend, had it that Dawson ducked into his shopping basket and pulled out a multi-pack of Wrigley's Juicy Fruit chewing gum. Dawson detailed later that this was not a lucky dip: he chose it because nobody had been sure that a bar code could be printed on something as small as a pack of chewing gum, and Wrigley had found a way out to the problem. Their passable reward was a place in American history.

Joe Forest said himself that it seemed like a fantasy: he had gotten the motivation for what turned into the standardized identification while sitting on Miami Sea shore. He attracted it with his fingers the sand. The thing he was pursuing was a code or the like that could be imprinted on goods and examined so general store checkout lines would move all the more rapidly and stocktaking would be rearranged. That such innovation was required was not his thought: it came from an upset market supervisor who had begged a senior member at Drexel Organization of Innovation in Philadelphia to think of some method of getting customers through his store all the more rapidly. The postponements and the ordinary stocktaking were costing him his benefits. The dignitary disregarded him, yet a lesser postgraduate, Bernard "Weave" Silver, caught and was charmed. He referenced it to Forest, who had moved on from Drexel in 1947. Forest was at that point a creator, and he chose to take on the test.

So certain was he that he would think of an answer for the grocery store issue that Forest left doctoral level college in the colder time of year of 1948 to live in a loft claimed by his granddad in Miami Sea shore. He had traded out certain stocks to hold him over. It was in January 1949 that Forest had his revelation, however the brightness of its effortlessness and its broad ramifications for current presence were not perceived until numerous years after the fact. It was Morse Code that gave him the thought. Forest had learned it when he was in the Cub scouts. As he was sitting in a sea shore seat and contemplating the checkout quandary, Morse came into his head:

I recall that I was considering dabs and runs when I stuck my four fingers into the sand and, out of the blue—I didn't have a clue—I pulled my hand toward me and I had four lines. I said 'Golly! Presently I have four lines and they could be wide lines and tight lines, rather than specks and runs. Presently I have a superior possibility of finding the dang thing.' At that point, just seconds after the fact, I took my four fingers—they were as yet in the sand—and I cleared them round into a circle.

Back in Philadelphia, Forest and Silver chose to check whether they could get a working framework moving with the innovation to hand. They originally documented a patent in 1949, which was at long last allowed in 1952. Despite the fact that the patent shows the essential idea, there is just a sprinkling of narrative proof about what Forest and Silver really assembled. An unrefined model in Forest's own home utilized an amazing 500-watt brilliant bulb. An oscilloscope was utilized to "read" the code; the entire thing was the size of a work area. Purportedly, it worked, to a limited extent. Yet, a target assessment made a decision about it to be 20 years comparatively radical. Forest and Silver had the correct thought, yet they came up short on the minicomputer and, basically, a brilliant light with which to "read" the highly contrasting standardized tag.

On July 16, 1960, when he originally observed the laser, the head of advertising at Hughes Airplane Organization of Culver City, California, Carl Byoir, proclaimed they were in huge difficulty: "It would appear that something a handyman made." Yet the following day, at a public interview held in the Delmonico Inn in New York, the organization made one of the most electrifying declarations throughout the entire existence of science. One of their examination researchers, Theodore Maiman, had made a "nuclear radio light more brilliant than the focal point of the sun." Maiman delivered for the newsmen his "laser," an abbreviation for Light Enhancement by Invigorated Discharge of Radiation.

The greater part of the columnists was anxious to realize what the laser was for, and what it could do. It resembled sci-fi. Maiman said the laser pillar was so thought, so "sound," that in the event that it was radiated from Los Angeles to San Francisco it would spread just 100 feet. The little shaft was hot and sharp enough to slice through materials. Might it be able to be utilized as a weapon? That was not the goal, Maiman guaranteed journalists. By and by, the Los Angeles Envoy featured its story: "LA Man Finds Sci-fi Passing Beam." This turned into a famous topic in the papers.

Maiman had dominated the competition to construct the absolute first laser, beating furious rivalry from around the globe. It is conceivable to envision the outrageous fervor that he and his partner Irene D'Haenens experienced when they created that first whimsical bar. They didn't know then what it very well may be utilized for, yet they envisioned it would have numerous applications in science and correspondences, in the business for cutting and welding, and in medication for fragile medical procedure. Be that as it may, as Maiman stated, "I didn't anticipate the store registration scanner or the printer."

A booklet delivered in 1966 by the Kroger Organization, which ran one of the biggest market chains in North America, closed down with a despondent wish for a superior future: "Simply dreaming a little . . . could an optical scanner read the

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cost and absolute the deal. . .. Quicker help, more gainful assistance is required urgently. We request your assistance." Kroger's business was goods, not gadgets, so the organization went searching for a band together with the essential skill.

A little exploration group at the incredible Radio Company of America (RCA) was taking a gander at a couple of new ventures, including the chance of a programmed bank money machine, which they chose would not go on the grounds that "the client would not be accepting the idea." At last, they lit on the standardized identification. A hunt of the set of experiences turned up some evidently nitwit plans: in one, clients chose punch cards that distinguished what they needed to purchase and introduced them to a clerk, who recovered the products from a store. This didn't endure long in the staple business. At that point there was the patent for a framework wherein the market customer tossed everything into a bushel, which was pushed under a scanner that recognized ever thing and printed out a bill.

They before long found the Forest and Silver patent. This was not the rectangular standardized tag that Forest had first conceived on Miami Sea shore yet the "bull's-eye" of concentric circles he thought would be a superior plan. At the point when he and Silver dealt with it, they chose the bull's-eye was the better image since it very well may be perused precisely from any point.

Printing the bull's-eye scanner tag end up being probably the best trouble in light of the fact that any flaws would make the entire framework unfeasible. A pivoting turret of ballpoint pens, and a pen intended for space travelers that could record potential gain, tackled a portion of the issues. This specialized turn of events, including a few organizations authorized by RCA, was to pave the way to the main genuine test at the Kroger Kenwood Square store in Cincinnati. On July 3, 1972, the main computerized check stands were introduced (One of RCA's pioneer check stands are in the Smithsonian assortment.) More check stands were introduced and a correlation with other Kroger stores told an irrefutable and promising story: the bull's-eye standardized identification hit the objective, with unrivaled marketing projections. In any case, this was only one store in a cross-country basic food item and market business worth billions. In the event that the laser and scanner tag were to change the checkout counter, they would need to be close all inclusive.

The objective of the Specially appointed Board of trustees of the all-inclusive Item ID Code could be expressed just. The delegates of the staple exchange were accused of figuring out how to present a General Item Code, a standardized tag of some portrayal that would be basic to all merchandise sold in grocery stores and engraved by the makers and retailers. The code would convey data about the idea of the item, the organization that made it, etc. In-store PCs would "read" this data with scanners and present their own varieties, which may include exceptional offers and decreases. The vision was there however the challenges in the method of its acknowledgment were overwhelming. Producers were frequently impervious to the possibility of a general code. They had existing techniques for ID of items, which would need to be disposed of or adjusted. Cardboard makers stressed that a printed code may ruin their item. Canners would not like to be obliged to put scanner tags on the base of jars. It took four years to show up at a useful recommendation to put to the entire business.

Eventually, seven organizations, every one of them situated in the US, submitted frameworks to the Image Advisory group, a specialized branch of the Impromptu Council. RCA, having shown to the board of trustees its framework in Cincinnati, took the view, not absurdly, that it was the lone genuine competitor.

In any case, at last, Global Business Machines (IBM) made an unexpected offer. It had no innovation at all to show to the board, and the choice to enter the opposition seems to have been a bit of hindsight, in spite of the fact that it had in it utilize in all honesty Joe Forest. As it ended up, in spite of the fact that he was associated with IBM's accommodation, he was not the maker of its form of the All-inclusive Scanner tag. That tumbled to George Laurer, who, in his own view, had a bit of leeway over his opponents on the grounds that neither he nor IBM had given grocery store checkout frameworks or scanner tags a lot of thought and his organization had no instant innovation. Beginning without any preparation, Laurer had no biases about the presence of the standardized tag, however his supervisors had accepted it would be some form of the round bull's-eye in Forest's patent and RCA's pioneer framework in Cincinnati.

Laurer was given the details for a standardized identification that had been controlled by the Image Choice Advisory group: it must be little and flawless, greatest 1.5 square inches; to set aside cash it must be printable with existing innovation utilized for standard names; it had been determined that solitary ten digits were required; the scanner tag must be coherent from any bearing and at speed; there should be less than one of every 20,000 undetected blunders.

In spite of the fact that there was wariness in IBM, Laurer was persuading enough to be given the go-head with a rectangular scanner tag. A division of IBM fabricated a model scanner, and Laurer's Widespread Item Code was tried. "There were numerous doubters in IBM," Laurer reviewed, "not the least of whom was [his boss] B.O. Evans himself. Nonetheless, toward the finish of a faultless show for Mr. Evans, we had our pro softball pitcher pitch beanbag ashtrays, with images on the base, as quick as possible over the scanner. At the point when everyone read effectively, Mr. Evans was persuaded."

It was another issue to persuade the Image Choice Council, which was under gigantic strain to acknowledge RCA's now working bull's-eye image and innovation that had done a lot to rouse certainty that a widespread item code could work. In the wake of requesting an examination of the opponent symbologies from researchers at the Massachusetts Establishment of Innovation, on Walk 30, 1973, in a New York lodging near Stupendous Focal Station, the board met to

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settle on its last and pivotal choice. The council's seat Alan Haberman requested that the initially proclaim how sure they were that the image they had picked was the right one. There was an extremely elevated level of certainty—around 90% for what it's worth—and the champ was Laurer's rectangular code. For Forest, who passed on in 2012 at 91 years old, it probably been a bizarre encounter to observe the resurrection in a modern type of the lengthened lines of Morse Code he had attracted the sand in 1949. There was presently an unassumingly evaluated laser scanner to enlist with a concentrated light emission the coded vertical lines of rotating dark and clear and a microcomputer to decode the data.

Like countless innovations, the UPC was not a prompt achievement. It was the point at which the mass merchandisers embraced the UPC that it took off, Kmart being the first. Indeed, scanner tag innovation was nearly made for organizations like Walmart, which manage a large number of products that should be classified and followed. The scanner tag took off in the staple and retail business during the 1980s, and simultaneously started to change producing and to seem like a rash on anything that profited by moment distinguishing proof. In 2004, Fortune magazine assessed that the scanner tag was utilized by 80 to 90 percent of the best 500 organizations in the US.

Despite the fact that the motivation for the standardized tag was the supplication by grocery stores for innovation that would accelerate the checkout, its most noteworthy incentive to business and industry is that it has given hard, measurable proof for what sells and what doesn't. It has changed statistical surveying, giving a rich image of individuals' preferences, and it has made creation lines more productive. The once-feared "demise beam" laser bar currently proves to be useful firearm estimated scanners that in a flash read and log anything from medical clinic medications to infants.

After numerous long periods of secrecy, the man whose information on Morse Code propelled the recognizable highly contrasting stripes at last got some acknowledgment. In February 1992, President George H.W. Shrubbery was shot at a public staple show taking a gander at a grocery store scanner and having a go at swiping a can with a standardized tag over it. The New York Times reporter reviewed this as proof that it was the first run through Hedge had seen a store checkout. At the end of the day, he was withdrawn from ordinary American life. His associates demanded that he was not struck by the curiosity of the innovation however by the way that it could peruse a harmed standardized identification. Fanciful or not, the story stuck and was viewed as harming to Shrub. In any case, as Forest's nearby paper put it: "George Bramble isn't one to hold resentment. No Sir." A couple of months after the checkout occurrence, Shrub gave Forest a Public Decoration of Innovation.

A. QR codes

1) Point of Sale (POS) system

With the growing demand for technology to palliate the burden on cashiers of the supermarket, a POS system was created. It was basically like the new-born baby version of a Barcode that allows for scanning the individual items to be registered by a computer. Despite the effort, however, this still wasn't enough. Supermarkets then faced obstacles: Barcodes can store only up to around 20 alphanumeric characters of information and function with one dimension i.e., one direction of coding.

2) The involvement of DENSO WAVE INCORPORATION

QR Code came up by the DENSO WAVE and their lead developer Masahiro Hara. They were contacted by supermarkets, then realized the limits of the Barcodes and looked for a way to make them more versatile and contain more information through the development of a 2-D Code (two directions of coding).

With the only team of two members, Hara was the first person to come up with the idea of the square, because their research showed that it was an easily perceivable shape. This shape additionally allowed for both horizontal and vertical Coded information. The further advantage of QR Code was that this also boosted the speed at which this information could be read (up to 10x faster than Barcodes).

The fusion was a jackpot. DENSO WAVE made their innovation of the QR Code public in 1994 without maintaining patent rights and the usage of QR Codes spread like a wildfire.

During the 1960s when Japan entered its high financial development period, markets selling a wide scope of wares from staple to attire started to jump up in numerous areas.

Sales enlists that were then utilized at checkout counters in these stores required the cost to be entered in physically. Along these lines, numerous clerks experienced deadness in the wrist and carpal passage disorder.

"Clerks frantically ached for some approach to help their weight."

The innovation of standardized identifications gave an answer for this issue. Thusly, the POS framework was created, in which the cost of a thing of product was shown on the sales register automatically when the standardized identification on the thing was filtered by an optical sensor, and data on the thing was shipped off a PC simultaneously.

As the utilization of standardized identifications spread, be that as it may, their constraints got clear too. The most conspicuous was the way that a standardized identification can just hold 20 alphanumeric characters or so of data.

Clients reached DENSO WAVE Fused (at that point a division of DENSO Enterprise) who were creating standardized identification per users around then to find out if it was conceivable to create scanner tags that could hold more data, saying, "We'd like the capacity to code Kanji and Kana characters just as alphanumeric ones."

Empowered by these eager demands, an improvement group at DENSO WAVE left on the advancement of another two-

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dimensional code, all out of their true craving to oblige clients' necessities.

Thinking back on those days, Masahiro Hara responsible for the advancement of the QR Code at that point recalls that individuals who were creating 2D codes at different organizations were completely fixated on pressing however much data as could be expected into their codes.

With standardized identifications, data is coded one way (one measurement) in particular. With 2D codes, then again, data is coded in two ways: across and up/down., Out of a powerful urge to build up a code that could be perused effectively just as being fit for holding a lot of data, Hara set out to build up another 2D code. He set out to attempt this with just a single other individual as his colleague.

The best test for the group was the manner by which to make perusing their code as quick as could reasonably be expected. At some point, he hit on the possibility that their concern may be understood by adding positional data showing the presence of a code to be perused.

This was the means by which the position recognizing design comprised of square checks appeared. By fusing these imprints into their code, rapid perusing got conceivable.

Everything looks OK, however for what reason did the imprints need to be squares instead of some other shape?

As per Hara, this was on the grounds that "it was the example most drastically averse to show up on different business structures and so forth."

On the off chance that a position discovery design is utilized in a code and there is a comparative looking imprint close by, the code per user may confuse it with the position identification designs. To maintain a strategic distance from this kind of wrong perusing, their position identification designs must be really extraordinary. In the wake of considering this issue altogether, they chose to do a thorough review of the proportion of white to dark territories in pictures and images imprinted on fliers, magazines, cardboard boxes, etc subsequent to lessening them to designs with high contrast zones. They proceeded with the errand of looking over incalculable instances of printed matter throughout the day for quite a long time. In the end, they thought of the most un-utilized proportion of highly contrasting zones on printed matter. This proportion was 1:1:3: 1:1. This was the way the widths of the high contrast zones in the position recognition designs were settled on. Along these lines, an invention was made through which the direction of their code could be resolved paying little mind to the point of checking, which could be any point out of 360°, via looking for this interesting proportion.

18 months after the advancement venture was started and after multitudinous and rehashed experimentation, a QR Code equipped for coding around 7,000 numerals with the extra ability to code Kanji characters was at last made. This code couldn't just hold a lot of data, yet it could likewise be perused in excess of multiple times quicker than different codes.

B. Arrival of the QR Code and ensuing endeavours to spread its utilization

In 1994, DENSO WAVE (at that point a division of DENSO Organization) declared the arrival of its QR Code. The QR in the name represents snappy reaction, communicating the advancement idea for the code, whose attention was set on rapid perusing. At the point when it was reported, be that as it may, even Hara, one of the first designers of the code, couldn't be certain whether it would really be acknowledged as a two-dimensional code to supplant standardized identifications. He believed in the exhibition of the code, notwithstanding, and was anxious to get out and about of organizations and industry associations worried to present it with the expectation that it would get referred to and utilized by however many individuals as could be allowed.

a)

Because of his endeavours, the QR Code was received by the vehicle business for use in their electronic Kanban*, and it contributed significantly to making their administration turn out effective for a wide scope of undertakings from creation to delivery to the giving of exchange slips. Likewise, in light of a recently arising cultural pattern where individuals requested that the ventures' creation measures be made straightforward mostly to make items recognizable, food, drug, and contact focal point organizations started to utilize the code to control their product. Especially, after occurrences, for example, the BSE problem* that compromised sanitation, the business needed to react to buyers' requests that the entire cycles of creation and coordination for the nourishments that wound up on their eating tables be made totally straightforward. The QR Code turned into an irreplaceable medium that could store a lot of data on these cycles.

b)

There was as yet another factor that contributed significantly to spreading the utilization of the code, and that was DENSO WAVE's choice to make the determinations of the QR Code openly accessible so anybody could utilize it uninhibitedly.

c)

Despite the fact that DENSO WAVE would hold the patent rights to the QR Code, it pronounced that it would not exercise them. This strategy was set up from the earliest starting point of the code advancement, respecting the engineers' expectation that the QR Code could be utilized by however many individuals as would be prudent. Hence, the QR Code, which could be utilized at no expense and without agonizing over likely issues, developed into a "public code" utilized by individuals everywhere on the world.

d)

It was in 2002 that the utilization of the code got broad among the overall population in Japan. What encouraged this pattern was the promoting of cell phones with a QR Code-understanding element. These telephones make it feasible for individuals to get to a site or acquire a coupon by filtering a

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peculiar, eye-getting design. The sheer accommodation served to quickly uplift the notoriety of the code among the overall population. Also, presently, it is an irreplaceable instrument for organizations and in individuals' day by day lives, utilized in a wide range of ways including for giving name cards and electronic tickets and in flight, ticket giving frameworks executed at air terminals. Global expansion and evolution of QR Code

Since the QR Code is an open code that anyone is allowed to use, it is used not only in Japan but also in countries all over the world. As rules for its use were stipulated and the code was standardized, its use spread further. In 1997, it was approved as an AIM standard* to be used in the automatic identification industry. In 1999, it was approved as a standard 2D code by the Japan Industrial Standards* and made a standard 2D symbol on the Japan Automobile Manufacturers Association's EDI standard transaction forms*. Still more, in 2000 it was approved by the ISO* as one of its international standards. At present, the use of the QR Code is so widespread that it is no exaggeration to say that it is used everywhere in the world.

While the use of the QR Code spread globally, new types of QR codes to meet more sophisticated needs were created one after another. A micro QR Code was created to meet the need for smaller codes. This is so small that it can be printed in a small space and it was made a JIS standard in 2004. In 2008, the IQR Code, which has a small footprint despite its large coding capacity and which allows the use of rectangular code modules, was released. The code also evolved into the use of rectangular code modules, which were released. Also, a type of QR Code that implements reading restrictions was developed to meet users' demands for an enhanced level of privacy and the like as the times changed. "Frame QR" was introduced in 2014. Frame QR can enhance the design of your code by freely combining illustrations and photos.

As has been described, evolutionary improvements have constantly been made to QR Codes, based on the technological expertise accumulated at DENSO WAVE, so that any of a wide range of varieties can be chosen to meet a specific need.

2. **Maker's enthusiasm for QR Code**

In 2012, the QR Code won a prize in the Media for Industry classification of the Great Plan Award* set up in Japan to completely advance mechanical plan. The explanation that the QR Code got this honour is portrayed as follows: "Its engineers assumed the test of building up an assortment of codes through planning, had the foreknowledge to put its advances in the public space from the beginning phases of improvement and planned a framework that has permitted common employments of the code in individuals' everyday lives." Eighteen years after the formation of the QR Code, this was the first occasion when that, aside from the QR Code's inborn usefulness, the plan of techniques for spreading the code's utilization and manners by which the code can be utilized was recognized and respected openly.

Hara proceeds to state, "Highly contrasting codes have become so ordinary at this point. I'd prefer to make more terrific QR Codes that can animate individuals."

In answer to an inquiry posing to him what sort of individuals the expectations will utilize the QR Code, he says: "I don't try to determine what sort of individuals will utilize it. I simply need to let many individuals utilize the code, thought of better approaches for utilizing it with them, and set up these thoughts as a regular occurrence. This is the way, I'd prefer to think, that transformative enhancements have been made to the QR Code."

What's more, he finishes up this meeting by saying, "This is my arrangement."

III. LITERATURE REVIEW

Quick Response codes are the two-dimensional matrix codes used to scan the image which consists of both horizontal and vertical lines. This can hold a large amount of data like numeric characters up to 7089 characters, alphanumeric up to 4296 characters, and kanji of 1817 characters. These QR Codes are actually modified from bar codes which are actually one-dimensional code. Bar codes can only hold 20-25 characters in it. It is the main disadvantage of it. 1D bar codes contain only horizontal lines whereas 2D barcodes contain both horizontal and vertical lines. QR codes are actually validated using one's mobile phone camera. Back in 2017's QR codes are used and are quite familiar to them. Back in those days, they needed to install a QR code scanner to read or scan an image. This was the major disadvantage of it. Now QR codes are being planned to make a comeback. The improved version of QR codes is available and are also customized and can also be made colorful, unlike previous QR codes that are in black and white. Although in this busy life, these matrix codes made the lives easier had also made to be aware of the malicious cybercrimes. There are many such issues faced due to being unaware of cybercriminal's malevolent things. These criminals create dupe of the QR codes to get personal information and hack the important information. Such cases also occurred.

QR Codes are becoming day by day the coming generation which helps for easy authentication, unlike user id and password. These are being effectively used in supermarkets, shopping centers, theatres, book stores, etc, and whatnot. QR codes have the ability to store a massive amount of data and quick ability to read also can scan in 360degree reading, small printed image error correction, providing support for more languages and durability against soil and damage. Many firms that are relatively new in online businesses tend to use these QR codes instead of the normal login process. So, that would

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make the customer easier for authentication instead of the traditional login process.

For fixing the QR data/security issues, a person named Xiaohe Cao proposed a safe QR code scheme that is based on visual cryptography. The security problems of QR codes are critical, such as data loss and data meddling as the implementation of QR Code is vast enough. The QR code is divided into two shared pictures which will be mediated singly. The development of the two shared pictures is based on the pseudo-random matrix, that is the pixels that are determined by the pseudo-random matrix values in the two shared pictures. The two images shared can only be assembled to resuscitate the data. The counterfeit output demonstrates that the picture of the QR code can be masked well and can be methodically reconditioned. Peter Kieseberg has examined how both automated systems and human interaction can be attacked using QR Codes. As the encrypted data is meant to be machine-readable only, one cannot metamorphose between a legitimate and a harmful amoral QR code. While the automated readers are very much jeopardized with SQL injections and command injections, one might be prone to phishing attacks. Peter Kieseberg's contribution is an examination of the QR code as a pounce vector, detailing different pouncing plans for the attackers to read and explore their implications.

A. Advantages of QR Codes:

The main advantage of QR Codes is their flexibility, which makes us very easy to use. They can be used almost for anything and are beneficial for both customers and marketing. It can also store a massive deal of data such as text, videos, advertisements, business card information, personal information, and any other type of digital information. QR Codes also fuse a different form of marketing streams, thus maximizing business exposure and generating more returns. QR Codes are tremendously cost-effective, as there are no start-up costs or periodic fees, and many QR Code generators and readers are free of cost. Using QR Codes can also save paper, thereby displaying content in a greenway. QR Codes are easily created, can also be customized to suit promotional items or products, that provide an easier way to manage the return on investment of one's marketing presence, and allow effective learning about the people's interests.

There are many no. of other use contexts that involve creating as well using QR codes by everyone as a tool to transfer data as described by Narayanan (2012). Examples include encrypt personal details in a QR code for others to scan and decrypt on one's devices or scanning someone's QR code to load their particulars on the reader's phone (i.e., by using the QR code as a machine-readable personal card), transferring invitations encrypting information about an event containing location in a QR code that can be posted on Web pages, or printed in other media, to be scanned by people who want to get the invitation). As an outline of advantages, they include the following:

• Can choose the action you want the consumer to take.
• To follow ISO standards.
• Completely quantifiable.
• Quick information was available to purchasers.
• Reduces repeated prints of advertising materials, and
• Is an established business tool. Hence, these advantages and uses of QR codes have found new endorsers. New endorsers and all users may not be familiar with that cybercriminal of using these same applications to introduce "spiteful QR codes."

B. Disadvantages of QR Codes:

People's lack of amicable with the QR Code is one of the biggest disadvantages of QR codes. Although QR Codes can be found nearly anywhere, people do not know how to get the data they require. The other considerable disadvantage is that a smartphone, as well as a QR Code reader or a scanner, are required to gain access to a QR Code. The ease with which one can create and share QR codes has not only attracted businesses, marketing, but also the criminal portion as well. QR Codes, like many other mobile applications, have been evolved with little forethought to security and safety. While most of us always cross-check about opening a questionable email or visiting an uncertain or inappropriate website and webpages, we often have no problem scanning or reading a QR code. Most people are not familiar that scanning an oblivious QR code offers serious security concerns. While the QR code itself is not dangerous, there is no chance to check the site that leads you to such as the case with an email or website and webpages. If the barcode application shows the URL, a user who keenly observes may notice a suspicious-looking URL. However, URL shorteners can make it tougher for users to check the legitimacy of a URL. Typically, the end-user reads the code without checking risks and then suffers the outcomes if there are security issues. It is quite simple for a sticker to be printed that contains a malevolent QR code and then attached over the legitimate code, a type of attack that is known as pouncing. QR codes are the perfect vehicle for malevolent attacks, facilitating phishing attacks, and reorient users to malicious websites that host viruses, worms, and Trojans (Jain and Shanbhag, 2012). Malevolent embedded URLs can lead to malware being installed on mobile phones and cause the loss of sensitive personal data and even damage to software and hardware (Narayanan, 2012).

When a user clicks a picture of a QR code, the link it stores is first shown on the device's screen; however, cyber offenders also use URL shortening services (such as bit.ly and others) to differentiate the ultimate address stored in the QR code which leads to a page with malevolent that abstracts the user's credentials or to a phishing site (Malenkovich, 2015). QR codes are seen in magazines, on billboards, and storefronts, almost everywhere. They seem to be anywhere and everywhere across the places we go, because of the unique ability of QR codes to bridge the distance between virtual and reality, many customers forget that QR codes pose the same

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risks as emails and websites that can have the ability to capture personal details. The general design of QR codes makes it difficult to find one from another with the human eye, which means anyone can replace legitimate codes with an illegitimate one using a sheet of QR coded stickers. In Russia, cybercriminals used hoaxer QR codes to siphon cash and personal data from hundreds of smartphone owners in 2011 and were refining their techniques to dupe even more users.

1) Statement of Problem:

Usage of bar codes and QR codes not only lightens our burden but also leads to a few problems or has its own disadvantages. These problems can be faced by anyone, anywhere. Here are a few issues that are unavoidable and to be cautious of:

- QR Code modules are distorted
- The QR Codes which have pictures and letters around it
- QR Codes that has overlaid of pictures and letters on it

These are the problems faced when the code is being read. The QR Codes can be read reliably when they are clearly printed or maintains standard to be scanned. Then only, there will be no problem can be faced. These are among one the issues faced during scanning, but there are also other basic issues to be solved.

1. Businesses misuse and abuse QR Codes
2. To use the QR Code, one must have a smartphone
3. User must have a QR code scanner app to scan
4. Often too little incentive to scan QR Code

IV. Comparative analysis of Barcode, QR Code, Snap tag, NFC, and RFID

This analysis gives you a brief knowledge about wireless sensors and their types like bar codes, QR codes, Snap tags, NFC, and RFID along with their characteristics and working components. These wireless sensors are the most standard measuring tools that are equipped with transmitters to convert signals from process control instruments into a radio transmission. Radio signals are interpreted by a receiver which converts the wireless signals into a specific and desired output, such as analog current or information analysis via computer software. A barcode is a technique of representing the information in a visual, i.e., machine-readable form. These barcodes are represented in parallel in lines and are also known as one-dimensional(1D), which are scanned by special optical scanners called barcode readers. QR Codes are also machine-readable codes which are in the form of two-dimensional matrix codes. These are known to be modified versions of barcodes. These contain both vertical and horizontal lines as well. They can store a massive amount, and data, also a high speed of readability. Snap tag is a two-dimensional mobile barcode that is similar to a QR Code but uses an icon or logo of a company and code ring rather than a square pattern of black dots. It is similar to QR codes which can be used to take a brand's website but also can facilitate mobile purchases, coupon downloads, video views, etc. These also offer back-end data mining capabilities. NFC is known as Near Field Communication (NFC) technology which allows users to make secure transactions, exchange digital content, and connect electronic devices with just one touch. NFC transmissions are short-range, only up to a few centimeters, and require the devices to be in proximity. On the other hand, this Radio-frequency identification (RFID) is a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer information from a tag attached to an item, for automation recognition and tracing. This comparative study shows the comparability among the technologies like bar code, QR code, snap tag, NFC, and RFID.

Name of technology	Durability	Cost	Information capacity
Bar codes	Can withstand harsh environmental conditions if they are durable	Expensive	1D barcodes have from 20-25 characters while 2D codes go up to 2,000 characters.
QR codes	Has the ability to perform error correction. Data in QR codes can be recovered even if a few parts of the image are destroyed.	Budget-friendly	Numeric-7089 characters, alphanumeric-4296 characters, byte-2953 characters, kana-1817 characters.
Snap tag	Can withstand all the conditions and also be recovered.	Costly	It is similar to a QR code.
Near Field Communication (NFC)	These are rewritable endlessly. Can be rewritten up to 100,000 times.	Costlier compared to other others	Stores passive data can also read and write under a few circumstances only. Between 96 and 8192 bytes.
Radio-frequency identification (RFID)	These have to be designed specifically to withstand all the	Costly compared to bar codes	It generally depends on the application and type of

	conditions.		tag but it cannot hold more than 2KB

The above comparison among mentioned gives you the overview of bar codes, QR code, Snap tag, NFC, and RFID technology. Although QR codes are budget-friendly, Snap tags are safe to use. Those are even not in black and white. Encrypting is also done safer compared to QR code. Although Snap tags are not much familiar around but in the future that will be a booming technology that might trash other technologies.

V. CONCLUSION

This paper described QR Codes as a technological advancement that connects the real-world to digital effortlessly. In this paper, although it contains much information about QR codes, there are also other revamping technologies to alter QR codes which takes some time to get familiarized. QR Codes have the future to take substantial heights, not only by providing data at the click of a button but also by being simple, easy, economical, and technologically improved. QR Codes ensure that consumers have important data at all times. The use of QR Codes abolishes human error. With QR Codes, data is accurate, true, and reliable.

The QR code technique is getting familiarized day by day and at the same time, it is becoming increasingly secure as the technology is intensifying. Once, the awareness about these codes enlarges, it will get a broad spectrum to evaluate its gravity. In the coming future, this technology will be used in wide inhabitant domains. Firstly, QR codes were used to put down the information about inventory items but nowadays it is being used in huge industries like marketing, secure payment systems, advertising, education systems, etc. The extensive design of a QR code makes it easy and cheap to create, as well as tough to identify whether it is a "good" QR code or a "harmful" one. But there are some steps that companies and individuals must be taken before simply scanning a random QR code and trusting that it would not introduce a malevolent code or do harm. Simply put, end-users should be alert, rather than scanning random code without paying attention to where any QR code may take them.

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