

Impact of QR-Codes as a Disruptive Technology During the Covid-19 Contagion

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Abstract

Introduction In the world economy, QR codes became very popular, and their prominence is expanding rapidly. The QR-codes look a bit like barcodes, but are made up of square patterns. As businesses are increasingly embracing these technologies, QR codes are becoming more popular, QR code readers are being integrated into smartphones. Apple released iOS 11 to search QR codes using the smartphone camera back in 2017 which is now a game-changing marketing strategy for businesses and retailers.

Objective: The objective of the paper is to conduct an extensive theoretical review on the growth of QR codes in the digital era and QR codes' reach as contactless payment solutions.

Methodology: A bibliometric review by refereeing quality articles published in highly ranked journal.

Conclusion: When the QR code reader was integrated into the new Android smartphone camera, it proved to be a key differentiator. Following the global COVID-19 contagion, there has been a nudge for contactless activities and remote resource allocation, such as online work, payments and online classes among others. QR-codes have seen a spectacular increase in usage across all aspects of life.

Keywords: Covid-19; Disruption Technology; FinTech; Innovation; QR-Code;

1. INTRODUCTION

The QR codes detect objects using machine-to-machine computer vision. The QR codes enable users to complete tasks without typing and provide a quick QR scan to the customer's mobile device. (Soon, 2008). When compared to shopping segments, the QR codes increase the speed of purchase capacity for every company. Like future augmented reality, QR codes have become more popular because they provide more machine vision data than a basic marker. (U.S. Patent No. 12/849,005, 2012). Another application is the use of a phone camera for remote detection, as the mobile camera can detect a QR code from up to 30 feet away. Global smartphone penetration was 48.8% in 2014, but it has enhanced by 13% by the end of 2019. QR Code as a business has risen exponentially, as measured by the sustained growth of global QR Code use. By 2022, approximately 90% of the world's population will have access to high-speed internet. In South Africa, approximately 80% of people own smartphones, making them more susceptible to QR Codes. (Juniper, 2021).

A global outbreak of a novel COVID-19 in early 2020 has resulted in significant changes in consumer behaviors and business models. During the contagion, authentication, identification, and security were critical. QR-codes came in handy during challenging times, and they were used in various applications, including self-survey of contact tracing

in the Netherlands. (Perez-Alba, Nuzzolo, Expinosa, & Camacho, 2020). Containment records and logs are being distributed worldwide, as is an estimate of the contagion and other contact tracing methods. (Nakamoto, Wang, Guo, & Zhuang, 2020). Manufacturers such as Pfizer use COVID-19 vaccine packaging used QR codes (Holm & Poland, 2021). QR codes were widely used for contactless payments, even outside the healthcare sector during the contagion. (Yan, Tan, Loh, Hew, & Ooi, 2021). QR-codes are used not only for payments but also for understanding consumer behavior and consumer purchasing trends. (Suebtimrat & Vonguai, 2021). QR-Codes have attracted attention in every country at the B2B level and also at the B2C level. (Ahmad, Asgahar, Khan, & Khan, 2020). The paper focuses on a statistical analysis of QR codes' use as a payment option around the global economy during the contagion.

A primary focus of FinTech startups is money transfer, particularly person-to-person transfers. WeChat Pay, which has transformed the way consumers interact with businesses and each other in China, is perhaps the most striking example of person-to-person financial transfers. (Brown & Lin, 2021). The rapid adoption of WeChat Pay (and, to a lesser extent, AliPay, a payment system offered by the Alibaba Group) has resulted in China becoming an (almost) cashless economy, where beggars can receive donations from WeChat Pay (Parsons, 2021)

2. BACKGROUND

Denso Corporation, a Japanese company, pioneered the use of QR codes in 1994. QR codes with segments provide a wide range of benefits. For starters, QR codes can hold far more information than 20-character UPC barcodes. (DENSO WAVE, 2021). Quick response codes were a game-changer in terms of connecting the print and digital worlds. Snapping a photograph of the barcode with a smartphone would allow access to the mobile site. (Code, 2017). People were still incensed by smartphone users' requirement to install scanning apps, which could take some time. According to a 2011 comScore study, 14 million mobile users scanned a QR or other barcode on their phones each year, and the number is rising year after year. QR codes are scanned at home, work, retail stores, grocery stores, restaurants, and public transportation. (Yusof, Goolamally, Latif, & Fadzail). It has grown exponentially among people aged 18 to 34 with household incomes of \$100,000 or more. The novelty of scanning QR codes wore off, but the extra work remained. Fortunately, by the end of 2020, QR-codes took a sharp transition in usability, with 11 million US households scanning a QR code in 2020. Like most other user-interactive technologies, QR codes are most likely to be used by younger and older demographic groups. Payments are automatically sent when a QR code is scanned; discounts via coupons and freebies are expected to reach 5.3 billion by the end of 2022; Documentation to gain access to more information about 83% of global growth since 2018, with 8% annual growth in smart packaging that is skyrocketing year after year. (Asset, 2021; Beaconstac, 2021).

QR codes and customized QR codes' reach to modern advertisers. By the end of 2021, the projection is that 90% of the world's population shall access high-speed broadband. The use of a smartphone to search for the QR code increases QR code adoption. Smartphones with built-in QR code readers are already present in market. The introduction of iOS 11 in 2017 and Android 8 and later OS versions made it so much easier for users to install QR-code reading apps. The built-in QR code scanning mechanism within the camera makes is simpler. QR code marketing will become even more ubiquitous. In May 2020, PayPal announced a new QR code feature for its smartphone app. (Pickard-Whitehead, 2021; Silverberg, 2021). This feature enables businesses to generate, print, or view a unique QR code as a means of accepting payment for in-store purchases or other in-person transactions. The phone's versatility allows small business owners to easily migrate to everyday payment options by requiring you to pay with a contactless tap. (Sorensen, 2021; Moran, 2019).

In Indonesia, a new financing workaround, the waqf-based Islamic fintech model, has been implemented to fund poor farmers' long-term and short-term projects. Adopting an integrated Waqf-based Islamic fintech model that provides halal financing mitigates Indonesian farmers' challenges in rural areas. Indonesian farmers confront numerous struggles, and most of them live below the poverty line with insufficient funds. A Murabaha contract allows poor farmers to obtain the farming equipment they require, such as seeds, fertilizers, tractors, combined, irrigation technology, and so on. Once the lending company approves the poor farmer's funding request, the farmer and the investment firm enter into a Murabaha contract in which the lending company divulges the cost and profit margin for the asset that will be made available to the farmer as per his proposal. Following that, the company will issue him a Murabahah QR coupon. Furthermore, using this Murabahah QR coupon, the farmer will obtain the necessary equipment from several merchants within Indonesia. (Khan, Ghafoorzai, Patel, & Shehbaz, 2021)

3. QR-CODE STRUCTURE

QR codes are a subclass of barcodes. The system was first launched in Japan by Toyota's subsidiary Denso. QR codes can store more knowledge and can be configured to execute different functions. QR codes have the potential to be read from a camera-enabled computer like a smartphone. The structure of QR code is illustrated in figure 1 below:

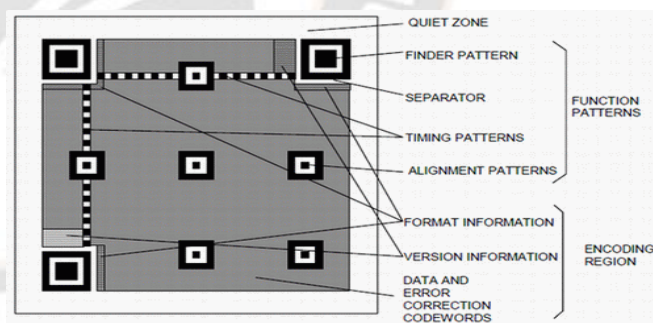


Figure 1: QR-Code Structure & Body (Garg, 2015)

A Module is the base unit of a QR Code reading. The black-and-white blocks in the QR Code are info. Data management and QR Code composition are given by modules (called the Data Matrix). Bits of data begin at the bottom-right of the matrix. It forms a two-module wide column before changing direction and rising. A QR Code will stay scannable even though it is damaged up to 30 percent. This is possible because of Reed-Solomon Error Correction. CDs and DVDs use this same algorithm to stay readable through scratches, wear, and tear, etc. Error correction can be set as desired.



Figure 2: Customized QR-Codes (qrcode.pro, 2021)

Figure 2 illustrates the customized QR-Code types which can be designed as user desired. Although not every QR code is perfectly square, most are found with varying patterns displayed inside. Direct mail, signage, billboards, and even commercials commonly feature QR codes scanned using phones, and smartphones are equipped better to read non-similar squares. Apart from standard QR-code, the QR-codes can be customized as per the choice of the user.

3.1. QR-CODE USES

QR codes have numerous applications. Generally, the most popular applications include customer service, downloading apps, having unrestricted network access, paying online, and using eCommerce. For enhancing customers' post-purchase experience, QR codes can be used to reorder products using QR codes or include product details like videos using QR codes.

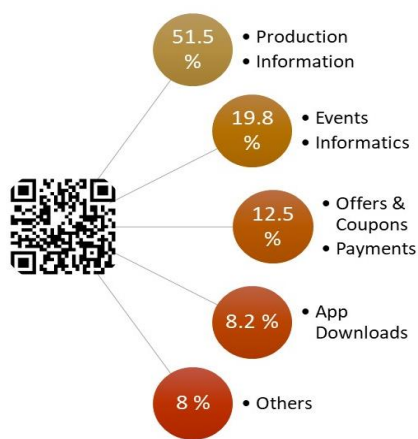


Figure 3: QR-Code Uses Globally. (Moran, 2019)

QR Codes are used for everything, figure 3 categorizes the uses of QR-Codes from charities to street sells, providing reviews, and even gifting. In any sector, QR codes are used for hospitals, marketing, banking, tourism, and athletics, to name a few. Although marketers have found their niche in QR codes, other industry verticals have also recorded success. The largest penetration in QR Code based on use-cases is for product information (51.5%) followed closely by

event information (19.8%), to avail deals (12.5%), and software downloads (8.2%) (Sorensen, 2021).

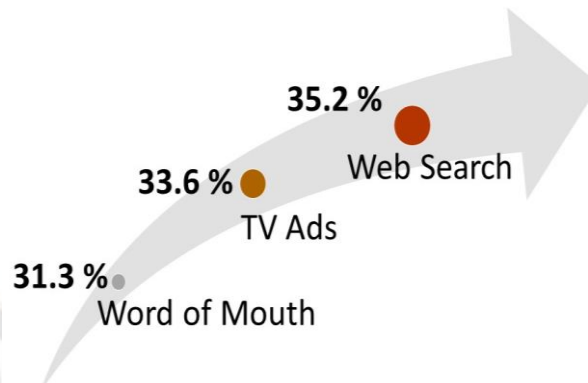


Figure 4: Promotional Sources for QR-code. (Moran, 2019)

Figure 4 categorizes the promotional sources of use of QR-Codes. The branding and promotions to enforce the usage of the QR code are done by search engines (45%), television ads (43%), and word-of-mouth (45%) (Moran, 2019)

3.2. QR – CODE STATS

By the end of 2020, Southeast Asia and India accounted for 15 million and 8 million QR Code scans, respectively (Asset, 2021; Beaconstac, 2021). 15 million users for Paypay in Japan and Paytm in India QR Code-based payment customers were signed up within 10 months of the launch of the app, the credit goes to SoftBank and Yahoo Japan (Asset, 2021; Indianexpress, 2020). Smartphones will use 5.3 billion QR codes by 2022, and 1 billion smartphones will access them (Juniper, 2021; Asset, 2021). COVID-19 associated shelter-in-place orders started in March of 2020, and 18.8% of US and UK customers appear to have seen a rise in QR code usage (Statista, 2021).

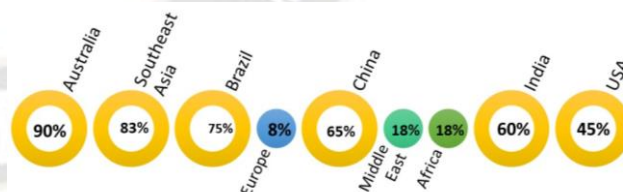


Figure 5: QR-Code Penetration Country Wis. (Beaconstac, 2021; Asset, 2021)

Figure 5 illustrates the statistics of QR-code penetration globally. By the end of 2025 more than 2.2 billion emerging markets will drive the growth and the QR code payment systems are expected to be used. With 29% popularity global mobile users and particularly for the use of the QR code payment systems. The growth of 240% is accepted in the USA only and global exchange of 2.7 Trillion USD; QR-code payments by the end of 2025 (Juniper, 2021). The value of

mobile POS payments transactions is expected to reach \$2,489.471 billion by 2021. Total value is estimated to rise at a 16.9% annual rate, reaching \$4,650,556,000 by 2025. Mobile POS users would reach 1,890 million, by the end of 2025. In 2021, the average transaction value per user for mobile POS payments is expected to hit \$1,670.2. From a global perspective, China (US\$1,318,962 million in 2021) has the largest transaction volume. (Statista, 2021).

4. PANDEMIC DISRUPTIVE TECHNOLOGY

QR codes were initially believed to be long-dead relics of the early 2010s, but they have been reincarnated as a result of the coronavirus contagion. In 2020, it has been utilized for a variety of purposes. Handful impacts are expected to be on the list of "future events" in 2021, with "QR codes making a comeback." Since the global contagion has already given the QR codes a boost, bringing contactless technology into the spotlight, there are few expectations that this will continue in the future. (Sentance, 2020). Personnel reductions postponed or canceled events, and general insecurity have emerged as persistent issues. During the contagion, the front-line workers in the healthcare, banking, tourism, and hospitality sectors have faced extremely challenging times. Managing employment issues in digital workplaces has been a serious concern for almost all industrial sectors. During COVID-19, the QR Codes have been one of the most widely used technology solutions, which helped in promoting social distancing. QR codes allowed users to access digital menus, visiting cards, and other documentation without having to touch anything. During the contagion, the primary use of QR codes is to store healthcare documents in a digital locker and access them as needed via a smartphone or tablet. The most commonly used QR-code scan is for contactless payments, with limitless uses of QR-codes in the Covid-19 pandemic. (Choudhary, 2020).

rate than other markets worldwide in the first quarter. (CBNEditor, 2021). By 2022, mobile payments' global use is expected to increase from \$348 billion to \$1.3 trillion. According to the study, supply is set to decline by 6.5 percent over the next five years, while demand is set to grow by 3.5 percent per year. (Research & Markets, 2020). Aside from online communities, the most popular payment app in the world is Alipay, a Chinese payment service. In China, 15 million small and medium-sized businesses (SMBs) embrace Alipay QR Code payments. (Sorensen, 2021). WeChat, came in fourth in terms of mobile payments, trailing Facebook, WhatsApp, and Messenger. (Sorensen, 2021). Paytm, India's digital wallet that uses QR Codes for payments, has 9 million merchants on the platform. Perfect in the Netherlands, some of the highest QR Code payments are from Belgium-Ban contact and Brazil-Cielo and Mercado Pago. In North America, the major QR Code payment companies are Apple Pay, PayPal, and Amazon Pay. (Moran, 2019). By the end of 2021, 10,000 UAE merchants will be familiar with the UnionPay QR Code. (Network, 2021).

5. LIMITATIONS OF QR CODE

Consumers are unacquainted with personalized QR codes, which may provoke trust issues at the merchant location when scanning for payment. Understanding how to personalize QR codes may necessitate customer preparation. It is not visually appealing, and there is no information about whether the trader details are valid or not because it is composed of random squares and boxes. A significant challenge faced with QR codes is their acquaintance with the public. A few consumers in the market utilize QR code technology. Many people find it easier to use the conventional methods of accessing information. It is impossible to convey to the public the information in a way that will be not noticed. QR code technology is used by a handful of market end-users. Many people prefer to use traditional methods of obtaining information. It is impossible to convey information to the public in a way that will go overlooked.

6. CONCLUSION & FUTURE SCOPE

The effective implementation of the QR codes for payments has a wide range of implications for financial institutions as well as other institutional investors. To remain successful, enterprises would need to swiftly implement new strategies. Interoperability is the primary driver. Whereas Alipay and Tenpay in China used proprietary QR codes, QR codes are becoming more ubiquitous. It provides excellent productivity for retail chains and increased scalability for banks. Card systems and wallets that provide proprietary QR code payments services, such as Paytm, Amazon Pay, Gpay, Alipay, and WeChat Pay, would have to choose between



Figure 6: Global QR-Code Payment Value 2020 (Hegde, 2021)

In the wake of global pandemic, the use of QR-codes has increased remarkably and the value statistics are illustrated in figure 6. The QR code payment system has recently experienced significant growth. Every small to large business is going full steam ahead and streamlining payment simplicity. China is the world's largest and fastest-growing mobile payment market. The value of third-party mobile payments, calculated in RMB 40.6 trillion, grew at a faster

complete interoperability and safeguarding their marketplace. The impact of QR codes on NFC payments may be another significant influence. Although NFC contactless payment options have triggered a lot of interest, actual use has been historically limited. To accept NFC payments, traders must either install a contactless card reader or update their POS terminal. As QR codes' use grows, market players will need to reevaluate their payment policies, and smartphone manufacturers will need to reassess what to do with NFC. India has already launched Bharat QR, India's first truly interoperable QR code payments. The National Payment Corporation of India has collaborated with MasterCard and Visa to launch Bharat QR, a new QR code payment system in India. In India, the merchant discount rate (MDR) has been capped at 0.4 percent under the merchant group "Bharat QR." The paper's future scope will be to study and analyze the impact of Bharat QR on other QR merchants and bank service charges with ATM/Debit and credit card usages.

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