ISSN: 2754-6659

Journal of Artificial Intelligence & Cloud Computing

SCIENTIFIC Research and Community

Review Article

Open Access

Enhancing Restaurant Payments with QR Code Integration for Apple and Google Pay

Akash Gill

USA

ABSTRACT

QR codes, when incorporated with Apple Pay and Google Pay on the receipts of restaurants, transformed the food ordering business and increased the efficiency of the payment systems. In the Go programming language, restaurants can print dynamic QR codes on receipts through ESC/POS printer commands for scan-and-pay transactions. This integration enhances the company's checkout process and makes transactions more secure via the Virtual Terminal Service (VTS) systems. The outcome was an effective change in customer behavior and a considerable trend toward the usage of mobile payments. This article will discuss how the system's technical work has been done, the security and convenience of the payment system for end users, and how current and future applications, such as loyalty programs, can be served. Thus, implementing this technology is a success, which shows the critical role that contactless payments are taking in current restaurants and the role that the integration of QR codes plays in enhancing the customers' experience.

***Corresponding author**
Akash Gill, USA.

Received: August 01, 2022; **Accepted:** August 08, 2022; **Published:** August 29, 2022

Keywords: Mobile Payments, Payments, Apc, Apple Pay, Google Pay, Esc/Pos Commands, Virtual Terminal Service –Vts, Contactless Payments, Go Programming, Restaurant Payment Solutions, Em/Mobile Wallets, Digital Changes, Payment Protection, Customer Satisfaction

Introduction

New trends include combining QR code payments with Apple Pay and Google Pay buttons at restaurants to make clear payments in a new way that is secure and safe for consumers during the pandemic. This capability is due to the utility of the ESC/POS printer commands supported in the Go language, which permits the creation of QR codes at runtime and directly on receipts. Since the usage of cashless payment methods has increased with the help of the COVID-19 crisis, where the interaction of sellers with customers is reduced to the minimum and the offerings of such systems, their usage was launched. The integration also provides an optimal payment solution by providing an integrated payment solution and making transactions safer through the payment that goes through the Virtual Terminal Service (VTS).

The use of this technology has, therefore, helped to redefine how customers conduct themselves. Another tendency that can be noticed is that the choice of payment methods also changed: the number of scan-and-pay increases by 62%, and the shift shows the decrease in traditional credit card use by 9% to mobile wallets. Such findings also emphasize the opportunities to use mobile payment solutions to improve restaurant productivity and ongoing user satisfaction.

Figure 1: QR Code Payments

Key Problems Solved

Several operational problems and customer experience issues emerged in restaurant management before QR code payments were integrated. These challenges include manual payment, common transactional mistakes, concerns about security, and the growing demand for contactless payment. To summarise, pre-existing QR codes relieved these pain points when connected to Apple Pay and Google Pay.

Manual Card-Based Transactions

In the past, restaurants used card swipe techniques through which the customers used to transfer their credit or debit cards to the servers [1]. This was sometimes done by inserting the card details on the payment terminal, which brought several vices. This depended on people entering the card data, making room for mistakes like typing wrong card details and taking more time to process, especially at rush hour. This inefficiency wastes the client's time and slows the restaurants' general functioning, enraging the customers and exhausting the workers.

The management of cards manually puts the customers and staff in contact with numerous risks of cart mismanagement and fraud. Processing the credit cards physically provided enumeration spaces through intentional carelessness or intent that enhanced the possibilities of mischarging and misuse. This method also entailed the customer cards being handled numerous times by servers while making transactions, which posed unnecessary security risks to the scenes. What was interesting was that some of these transactions remained very much manual. While this was not terrible for the restaurants, it was not ideal for their payment systems, which caused operational problems and problems from the customers' perspective.

Through Apple Pay and Google Pay adopting QR code repayments, the handling of physical cards was wholly done away with. The cards could be retained in the possession of the customers, while the receipts could contain a QR that could be scanned using the customers' handheld devices, which would take them to the payment gateway. This not only facilitated the checkout process but also cut down the chances of error, which would prevail when one had to manually fill in the card details. One of the benefits highlighted in the change to using mobile payments is flexibility in the overall method of processing payments and convenience, especially during business or holidays.

Consequently, people had to wait much less time at the checkouts, which happened due to the speed and efficiency of restaurant transactions [2]. Customers had an easy and less hassle payment process, while restaurant staff did not deal directly with the customers' payment details. They only had to infuse more money to increase the efficiency of operation while at the same time reducing the rate of fraud in the payment system, making it safer, faster, and more reliable.

Figure 2: Understanding the Differences Between POS Systems and Swipe Card Machines

Hygiene Concerns

Due to the COVID-19 crisis, people have become sensitive to hygiene and cleanliness regarding social interactions, especially food and accommodation [3]. Before the COVID-19 crisis, card-related processes also included many physical interactions that involved cards being passively passed from the clients to the servers, who then proceeded to swipe or insert the cards into the respective devices manually. It increased the probability of germ exchange, especially since people had to avoid immediate contact during the COVID-19 pandemic.

Because of the lockdown measures, customers began avoiding contact with other people and fearing to touch such objects as payment devices or handing their cards to someone else [4].

Some of the customers were not pleased with the prospect of repeatedly engaging objects whose surfaces had been touched by others. The restaurants, in particular, face a similar challenge of decreasing the number of high-risk contacts and surfaces to deliver comfortable experiences for the clients and employees. The problem was achieving this operational efficiency without compromising on these legitimate hygiene concerns.

To eliminate this problem using QR code payments solved this problem by offering an entirely touchless approach to payments [5]. Integrating contactless payments like Apple Pay and Google Pay was a great advantage to restaurants because it allowed customers to pay without touching or handling other customers' cards or the payment terminal. Customers were only required to use their smartphones to scan the QR code on their receipts, meaning that the many touching points that caused infection were eradicated, thus providing a safer payment experience to customers.

This form of contactless delivery not only formed part of the health standards embraced by customers with an illness but also supplemented the image that the restaurant business has good safety standards. The use of QR code payments was an effective way of bringing some level of comfort to customers because when making payments, people tend to worry about touching surfaces or instead being in close contact with strangers, especially during a period in which health was and is still a paramount concern in everyone's life.

Transaction Security

'Cards-present' transactions or the conventional 'swipe the card' kind of purchases, typical in the restaurant setting, were a notable security concern for restaurants and their customers in the case of card-not-present transactions such as online orders and delivery services. Such transactions included typing in all the card details either on forms on websites or over the phone, making the consumer confront threats such as fraud, data breaches, and unauthorized transactions. Lack of tangible card insertion to the terminal raised the chances of credit card fraud, thus causing both businesses and customers to lose money.

The QR code payments incorporated with Apple Pay and Google Pay enhanced the transactional security by using elaborate encryption and routing systems [6]. Real commerce happens whenever a customer scans the QR code; the payment system uses the Virtual Terminal Service (VTS) system to minimize the vulnerability to any sensitive financial information released to the hacker. This process also reduces vulnerability to unauthorized persons or fraudsters since there is no requirement to enter the payment details.

Apart from controlling data transmission, Apple Pay and Google Pay have implemented tokenization and biometric identification processes for security purposes [7]. Tokenization was used to exchange sensitive card information with a token; the token could not be used anywhere other than in that particular transaction to accommodate the customer's credit card data securely. Adding a biometric form of authentication like a fingerprint scan or facial recognition to make the payment confirms that the intended user was the intended user.

Adding these features to the VTS system made QR code payments safer for restaurants to process since the risks of hacking had reduced significantly. Customers could feel assured that their financial details were safeguarded, and restaurants experienced fewer cases of fraud and chargebacks, hence the general improvement of the payment process.

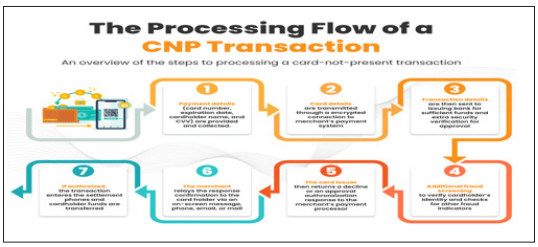

Figure 3: Understanding Card Not Present Transactions & Fraud Preventation

Inconsistent Payment Experiences

Before using QR code payments, restaurants needed help delivering a similar payment approach in various service contexts [8]. Takeaway or delivery orders were manually entered through a card swipe machine to a handheld device or online payment gateway. This inconsistency posed complexity for the customers who would be using these distinct modes of payment and, hence, may sometimes be frustrated depending on the service mode.

This variation in paying also posed operational issues to restaurants, mainly regarding payment methods. Instead of using one system to accept all orders to be delivered to the customer through dine-in, delivery, and takeaway services, there were different forms of payment systems, hence making it difficult for staff to conduct transactions. This frequently resulted in delays, some inaccuracies, or misunderstandings, especially when the restaurant received many orders during the rush hour for one or different services.

QR code payments play an important role in solving these issues and standardizing the payment process so that the scenarios can be well-conducted in different services [9]. Regardless of pick-up, eat-in, or delivery services, the flow was always simple: scan a QR code and perform contactless payment through Apple/Google Pay. This consistency optimized operations and enhanced the customer experience because the patrons did not need to learn a new way to pay regardless of the contact channel they used while accessing the restaurant.

QR codes also allow restaurants to provide a smooth and quick payment option throughout the contact points [10]. Consumers noted ease and standardization of payments as an advantage that positively impacted the general experience at eating joints. On the other hand, restaurant employees, including servers and other wait staff personnel, benefited from less complicated means of dealing with payments to heighten their efforts in attending to restaurant consumers.

Figure 4: Generation and Utilization of QR Code Payments in Business

High Processing Costs

Increased competition forced by the Internet and other technological advancements also contributed to the poor profitability of the high processing fees accompanying traditional credit card payments in many small and medium-sized restaurants for a long time [11]. The charge may be too much for the restaurant's cormorants, mainly when processing large-volume transactions. This comes from an increased cost of accepting credit card payments, and restaurants were searching for a cheaper solution.

This problem was solved with the emergence of Apple Pay, Google Pay, and other digital wallets. These platforms can be paired with lower transaction fees than traditional credit card networks, which allows restaurants to sever ties with established payment processing [12]. This had benefits such as the ability for restaurants to apply reasonable processing costs to encourage customers to use mobile wallets through QR code payments.

QR code payments also allowed restaurants to negotiate better rates with payment processors as mobile wallets started taking a more substantial market share. With the increased contraction of digital wallets to perform habitant transactions, consumers and diners could use this as a bargaining tool to get better terms and deals that decrease their overall payment for transactions. This movement towards mobile payments helped ease some of the cost burdens related to high transaction costs since restaurants could divert their attention to more relevant aspects of their business.

The application of QR code payment facilitated the management of operational expenses, as the payment option was fast, secure, and convenient for customers. This way, restaurants are prepared to meet the increasing demand for digital payments and improve their revenue and customer satisfaction [13].

Queue Management and Speed

This has been seen to be one of the significant issues affecting restaurants, especially during peak seasons, when many people could wait in line at the POS. Physical cards, especially where card transactions are handled manually, are most of the time causes of hindrances in the payment process. Not only does this inconvenience the customers who are forced to wait, but it also significantly decreases the turnover rate at the tables, which cuts off the restaurant's chance to serve more people and make more money.

It was established that using QR code payments enhanced the speed of payment and the time taken at the point of sale [14]. One innovation that affected this aspect was that customers ordered food through a QR code that led them to pay from their phones, thus minimizing their time at the counter. Consumers did not have to settle for a server to key in their card physically; they could do it quickly. This made service faster since most of the time that would have been used doing administrative work was freed up and used in carrying out other duties.

Thus, during rush hours, the restaurants observed enhanced queue control. Faster payment processing provided the understanding that tables could be flipped faster; therefore, the restaurants could feed more people in less time. This improvement in efficiency had a direct Positive Impact on revenues since restaurants, for instance, could serve more clientele without compromising on service deliveries.

Enhanced payment time increased customer satisfaction. Consumers stated that QR code payments were faster than traditional payment methods, so they did not have to wait around to make payments. Besides increasing customer satisfaction, this level of service contributed to restaurants' ability to establish customer loyalty.

Declining Cash usage

Cash usage has been reducing over the last few years thanks to an increasing adoption of digital payment products. This has been brought about by adopting technologies such as mobile wallets and other contactless payment methods, which young people prefer. While using cash in restaurants, consumers were suddenly forced to change the trend without posing the challenge of adapting to using cards with restaurants that offered the convenience of accepting such payments without putting in place embarrassing but more cumbersome structures.

This facilitated the expansion of restaurants' acceptance of digitalizing payments due to the introduction of QR code payments. Adopting these payment structures in restaurants brought the businesses to par with their customers. More importantly, it strategically placed the restaurants to futureproof their payment services by allowing customers to pay through Apple Pay or Google Pay [15]. It also helped them remain relevant to the customers who usually ordered digital wallets while at the same time reducing contact between both the staff and customers' cash, which can be cumbersome for management.

Customer Satisfaction and Retention

Before using QR codes for payments, clients had to endure slow or tedious payments, making their dining experience less enjoyable [16]. Payment must also be made quickly, especially when many people are checked in at a restaurant or when many orders are placed. It can, even if it can be a positive, impactful dining experience. This was because the frustrated customers barely returned to the restaurant, and the restaurant lost business.

The adoption of QR code payment reduced the time and inconvenience of payment, enhancing customer satisfaction [17]. Since the customer could use their smartphone to scan the QR code provided and make payment instantly with Apple Pay or Google Pay, the customer did not have to wait for the server to accept the card and process the payment. This cut the time people spent waiting in queues to pay and gave the customer more control over the payment process, which could be done at their leisure.

Using advanced features such as the provision of mobile wallets enhanced restaurants' appeal to the IT generation, as clients preferred shops that had new and developed technologies. The study also distinguished that such consumers as the younger ones appreciated convenient payment methods that are modern and easy to use in restaurants. This was compounded by the simplicity of making QR code payments as well as the convenience and security offered by Apple Pay and Google Pay, factors that assisted in enhancing customer satisfaction, thus warranting patronage for subsequent meals.

QR code payments helped restaurants improve their offerings and, therefore, form long-term bonds with their consumers. The changes addressed the existing customers' payment issues, and new customers could also be gained, leading to the restaurants' future success in a competitive environment.

Table 1: Key Problems Solved through QR Code Integration

Problem	Pre-Implementation State	Post-Implementation Solution
Manual Card-Based Transactions	Manual entry of card details, prone to errors and time-consuming	QR code payments eliminate the need for physical card handling and manual entry
Hygiene Concerns	High-touch surfaces (payment terminals) increased health risks	Contactless payments through QR codes reduce the need for shared surfaces
Transaction Security	High vulnerability to fraud and data breaches	Secure routing via VTS system, tokenization, and biometric authentication
Inconsistent Payment Experiences	Varied payment methods across dine-in, takeout, and delivery orders	Standardized payment process via QR codes across all service scenarios
High Processing Costs	Traditional card payments incurred high processing fees	Lower processing fees with mobile wallets (Apple Pay, Google Pay)
Queue Management and Speed	Slow checkout process led to bottlenecks and longer wait times	QR code payments reduce transaction times and improve table turnover
Declining Cash Usage	Difficulty managing cash transactions as customers shifted to digital payments	QR code integration supports growing digital payment trends
Customer Satisfaction and Retention	Slow payment processing impacted customer experience negatively	Faster, more secure, and convenient payment process boosts satisfaction

Technical Implementation

As for the technical aspect, it was possible to use advanced procedures to place QR codes for Apple and Google Pay on restaurant receipts [18]. This solution primarily used ESC/POS printer commands in the Go programming language to generate and print variable QR codes on customers' receipts. This solution made possibilities to print receipts on all kinds of receipt printers while there was a part for customers to make fast and safe payments using their mobile wallets. When planning, implementing, and executing this functionality, the technical architecture used had to allow for flexibility, security, and ease of use from the customer and the restaurant's physical side [19].

ESC/POS Commands in Go

ESC/POS is a standard command protocol by a receipt printer, especially in the hospitality and retail services industry. It enables new text, barcodes, and any other dynamic receipt items to be directly printed on the paper receipts. In this implementation, developers used ESC/POS commands under the Go programming language to develop a system that dynamically generates the QR cordially. These codes were incorporated for the use of Apple Pay and Google Pay for direct payment, which made the system very flexible to the needs of various restaurants without replacing most of its hardware [12].

ESC/POS could be controlled effectively by developers; however, with the Go language, which is statically typed and high-performance programming. Go offered all the freedom to address the formatting and contents needed to accommodate various models of printers. Moreover, its concurrency model provided

for multithreading, that is, to serve multiple receipt requests in parallel during those heaving periods most restaurants experience. For instance, usability had to be tested in increased transaction environments such as high-traffic restaurants to ascertain that the system can produce the necessary number of QR codes with speed and pinpoint accuracy.

Implementing Go also meant supporting and interacting with existing receipt printers, a significant cost saver for restaurants [1]. In some ways, restaurants could leverage existing technology and print receipts containing bar codes such as QR codes and payment symbols. Many developers are glad that the printer supports ESC/POS commands, which enables them to manage everything concerning the positioning of the QR codes, the position and size of the logos, such as those for Apple Pay and Google Pay, and other textual details.

In other words, integrating Go and ESC/POS commands provided a highly customizable and flexible technique. One great advantage for developers could have been the possibility of changing the format of the receipts, altering payment gateway links, or changing the parameters of the QR codes with minimal interruptions to standard processes. This flexibility allowed system designers to ensure that the system's user interface would best fit the restaurant where it was implemented, which would be valuable for both the customer and the employees.

Table 2: ESC/POS QR Code Payment Workflow

Step	Description
Step 1: Receipt Print	ESC/POS commands in Go are used to print receipts with dynamic QR codes and Apple/Google Pay logos.
Step 2: QR Code Scan	Customers scan the QR code with their smartphone for payment using Apple Pay or Google Pay.
Step 3: Secure Payment	Payment information is securely routed through the VTS system for processing.
Step 4: Confirmation	Customers receive a confirmation of payment, and the transaction is logged in the POS system.

URL Encoding; QR Code Generation

The technical difficulty related to this implementation was printing readable and, at the same time, secure QR codes on receipts. These QR codes have to point to URLs that navigate users to acceptable payment systems from Apple Pay and Google Pay [20]. URL encoding made this possible, which was used to format all the URLs needed by both payment systems properly. Encoding also guarantees that data passed through the QR code is not altered when transmitted and that the customer's handheld device reads the characters appropriately.

A Go-based library generated the QR code images based on the payment URLs encoded with the help of the QR code algorithm. The general library used to create the QR codes had the needed error correction level; this is very important if you consider that the receipt might be slightly turned, wrinkled, or crumpled. The amount of error correction incorporated into the QR codes varied with the application, with restaurants being coded with higher error correction levels to accommodate for exposure to wear and tear and other possible degradation of the receipt.

There were also things like the developers had to ensure that the payment links embedded in the QR codes were well constructed to contain both Apple Pay and Google Pay [20]. This entailed the creation of URLs that would take the customer to the right payment platform, depending on the device they were using. For instance, iPhone customers will be channeled toward Apple Pay, while clients with Android phones will be similarly routed to Google Pay. This smooth redirection involved the integration of device detection scripts, which are built into the backend environments used to create the QR codes.

Safety was the other primary consideration in the URL encoding and the generation of the QR codes. All payment URLs were encrypted and tokenized for security reasons to avoid tampering or misuse. This ensures that if somebody tampers with the URL, they will not be in any way able to access any payment information. Besides, one-time-use URLs that had a certain lifespan or could only be used once the transaction was made added to the system's protection and made QR code payments safe and comfortable for the customer.

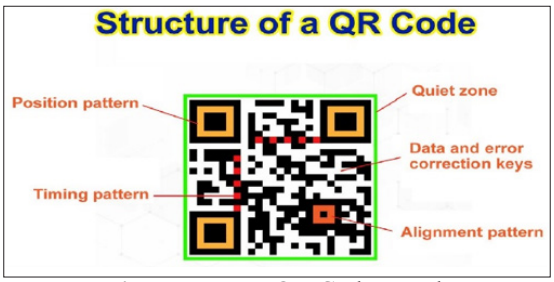

Figure 5: How QR Codes Work

Integration with VTS System

Connecting to the VTS system was another important factor that made it possible to process payments securely and quickly with the help of a QR code. VTS became a link between the customer's mobile device, the payment gateway, and the restaurant's POS. After the customer had scanned the QR code and began the payment through Apple Pay/Google Pay, the VTS system facilitated the movement of payment data while maintaining compliance with various security measures and the industry data encryption requirement.

In particular, the role of the VTS system was to provide a safe path for transferring payment details between the customer and the payment processor [21]. This system ensures that individual customers' information, including credit card numbers, tokens, or whatever a customer pays for, is never entered into the restaurant or revealed to any restaurant staff members. However, the VTS managed all the transaction activities to complete them efficiently and safely without the consumer's involvement. It also lessened the various dangers of CNP transactions because the VTS system employed secure encrypted communication links to transfer payment information.

The VTS system was built into both Apple Pay and Google Pay's security systems to further improve the security of transactions. These mobile wallets integrate sophisticated functions such as tokenization – a method where actual card data are substituted by a token that works for only one transaction. Along with that, through the tokenization process, all the transactions of the Sicredi VTS system were protected from fraud and unauthorized access through encryption.

The interaction with the VTS system provided several advantages for restaurants regarding operational efficiency. Since the VTS

system acted as the end handler of transactions, restaurants did not have to have multiple complex payment processing roles and integrate with various third-party systems. The VTS system also updates the restaurant's POS system with the payment status in real-time transactions. This integration ensured restaurant owners had complete transparency in their payments while eliminating the complex technicalities of managing the payment systems.

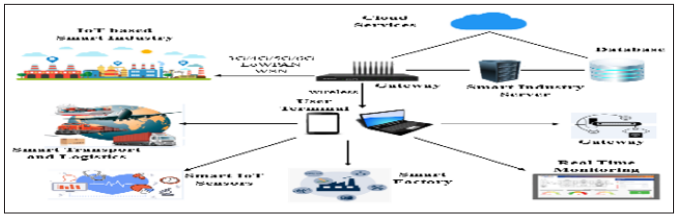

Figure 6: Industrial IoT Trends show Recent Applications for Industrial IoT

Use of Payment Icons to Improve User Experience

Regarding factors affecting the successful implementation of QR code payments, user experience emerged as an essential parameter, including customer visualization. One more feature that was very effective was the change of adding Apple Pay and Google Pay icons right to the QR codes on the receipts. These familiar symbols provided instant cues to the customers and advised them that they could pay with their chosen mobile wallets without any confusion about possible payment options.

From a technical perspective, adding and adding to physical print was difficult, and formatting such records was challenging [22]. With the help of ESC/POS commands, the developers could place the icons in the most advantageous place. Thus, the receipt is not congested with the icons, and they can be easily noticed. It was also found that developers could accommodate the size and resolution of the icons to print clearly on the printer, regardless of whether it was a minor or old printer. That is why, thanks to the features of the ESC/POS command set, restaurants could find matches for their branding and design preferences.

The user interface design was simple so customers could easily distinguish the payment system. Due to the use of easily recognizable branding like Apple Pay and Google Pay, many users have adjusted to the new system since they have used these brands for other uses. Thereby, the visible evidence that numerous customers are using the QR code proved that it is safe for clients to use the system, hence the increased usage of the QR code system.

An additional advantage of placing the icons beside the QR codes meant that restaurants developed a straightforward method that only needs a little elaboration or orientation. Viewed from the customers' perspective, they merely had to rapidly read the code, choose the payment they wished to use, and make the purchase in seconds. In addition to speeding up the payment process, this worked effectively because the kind of design automatically appealed to customers' senses since they saw the benefit of having to use the system this way and that. This was made possible by using several non-verbal signals in combination with the technical stability of the system, which made the QR code payments quick and easy for all customers.

Advantages and Applications on Various Industries

Incorporation of QR code payments into restaurant environments entailed many additional advantages that went beyond the handling of manual card transaction issues. It offered restaurants a new, flexible, highly applicable solution for industrial and customer needs change, as well as a large-scale payment solution. As the restaurant industry shifts towards relying more on technology, this innovation made restaurants future-oriented in a generation inclined toward a less-cash society [23]. With this technology, by integrating mobile wallet platforms such as Apple Pay and Google Pay in their restaurants, restaurants could benefit from some trends in technology, produce enhancements, and ultimately boost customer satisfaction.

Beyond the places where such payments eliminated specific pain points like entering card details or card processing errors, the technology provided restaurants a way to prepare themselves for future changes to payment processing [24]. Eliminating the handling of cards offered the system an adequate answer to the growing market need for contactless payments. This kept restaurants' operations seamless even during periods when the focus on hygiene is intensified, for instance, due to the COVID-19 pandemic. These QR code payments also reduced restaurant work internal processes, the trainability of employees, and enhanced overall customer relations.

Pandemic-Driven Demand for Contactless Payments

During the pandemic, the COVID-19 crisis led to new customers' perceptions of cleanliness and safety, particularly in shared spaces. There was increased adoption of contact-free solutions since consumers wanted to avoid touching some surfaces, including money, credit cards, and transaction devices. Due to such changes, restaurants' stakeholders sought new ways of paying for meals and adopted QR codes for mobile payments as secure and clean methods.

The above dynamic trends were addressed in real-time by adopting payments through QR codes. Some of the measures the restaurants could put in place to reduce contact with both the physical cards and the physical terminal include Developers of restaurants allowing patrons to use a QR scanner and pay directly through Apple or Google Pay. Besides serving the customers' health concerns, this was also effective in minimizing the spread of germs from the surfaces that many people touch, especially during the COVID-19 outbreak.

Apart from the toilet strategies, contactless payments became an effective means of branding for restaurants. Regarding the ideas about introducing QR code payment systems, it is necessary to state that it can help businesses position themselves as progressive and consider the tendencies in the field of public health [25]. The customers were willing to dine with establishments that made it apparent that they were doing everything possible to protect their health, and adopting card-only payments was the primary way through which the restaurants were more concerned with the safety of the customers and differentiated themselves. Furthermore, due to the COVID-19 pandemic, the regulatory bodies across the different regions started promoting the 'no contact payments' and integration of QR codes also stated. The restaurants did the same as per the measures of safety.

The effect of this change is expected to persist beyond the impact of the pandemic because many customers have adopted fewer contact payments as the new normal. Those establishments that incorporated QR code payments addressed the need for safer transactions while also setting up the basis for long-term appreciable customer retention by catering to new consumer trends.

Reduced Payment Errors

QR code payments proved necessary before restaurant guests experienced a challenge with card entries, which was tiresome and prone to mistakes. This situation meant that many employees had to key in the card details into the POS, which, in most cases, resulted in incorrect entries, such as wrong numbers or wrongly processed transactions. These errors were reflected in the various transactions' delays, customer frustrations, and organizational unproductiveness. In high-volume restaurants, such mistakes posed a more severe issue, resulting in more long queues, delays, and thus less profits.

QR code payments helped eliminate many of these errors because of the simplification. Users are relieved of having to provide their physical cards or type in their payment details. They used their mobile device to scan the QR code on the receipt, and it redirected them straight to Apple Pay or Google Pay. This helped to rid the process of a lot of human error since data did not have to be entered manually again and again. Restaurants that followed a better payment processing system had fewer mistakes, better efficiency, and better transaction accuracy, and customers could check out faster and more smoothly.

In addition, there were fewer payment disputes as there were no issues regarding manual entries. Unprocessed transactions led to chargebacks or customer outcry, which meant that staff had to devote time to correcting mistakes. This significantly reduced the number of such disputes and served as an extraordinary time and energy saver concerning payments using QR codes. With the use of secure, tokenized payment methods such as Apple Pay and Google Pay, the risk of fraud was eliminated, making the transactions more accurate and safer.

To sum up, QR code payments increased restaurants' accuracy. By paying more attention to errors usually made when making these payments, companies will be better positioned to offer their clients a more consistent service and eliminate interferences in their processes.

Scalability for Chain Restaurants

The first significant benefit of implementing QR code payment systems is scalability [26]. Companies operating in several outlets, such as chain restaurants or franchises, can quickly implement this kind of payment to their outlets. Conventional POS solutions entail significant investments in structures and sustaining costs, especially when implementing the solutions across many centers. However, with a mobile wallet included in the QR code payment system, it was a highly affordable solution that could be implemented with the least amount of hitches and standardized across hundreds of outlets.

It was possible to innovate the QR code systems in a modular structure to enable chain restaurants to expand and apply the technology rapidly depending on the requirements of a specific location. For example, restaurants could localize payment options and adjust them according to local culture or incorporate the platform with deals and coupons applicable only to the area. It would not allow brand standardization while providing the option to make some changes, which are likely important in franchises.

QR code payments were seen as flexible in scalability, which includes additional system updates and improvements. Several restaurants could quickly notify customers and update their outlets' QR code payment structure, ensuring everyone uses the current security features, software, and payment methods. A centralized control of such schemes has the added advantage of not requiring each site to be set up and managed individually, which adds to time and operational costs.

The technical scalability was good, and it is evident that the system was able to manage the number of transactions without issues of delay or failure, which was significant for chain restaurants with high customer traffic. With increased traffic in these outlets, QR code payment systems ensured that the firms could cope with increased demand while delivering a standard service to the customers across all the areas of operation.

Future Potential for Loyalty and Rewards Integration

Although QR code payments' significant advantage is facilitating transactional processes, combining it with a loyalty program and reward system creates a new opportunity to improve customer loyalty. QR codes can also be associated with the customer database; hence, restaurant purchases can be tracked on the go with rewards or loyalty points. This builds up a much better experience as clients can claim bonuses and promotions and even acquire points frequently by scanning a code.

Establishments such as restaurants could give loyal customers free voting vouchers, a complimentary serving of a particular meal or dish, or free delivery when a client uses a QR code to pay. These incentives could also be changeable, such as offering different incentives per person's likes, dining patterns, or events. Furthermore, QR codes allow customers to target more business from returned patrons by providing them with time-bound special deals or special offers that can only be availed at the restaurant the next time.

Including the loyalty schemes in the QR code payments enables restaurants to gather customer information. With access to this information, vendors can obtain a better segway of Customers' needs, wishes, and expectations. This information will help restaurants to create powerful marketing campaigns and enhanced menu services. This way, by connecting payments, rewards, and customers, restaurants can make more meaningful customer connections and engage patrons for the long term.

Some of these scenarios may also include the contract of restaurants that own franchises and other companies undertaking joint marketing strategies using QR code payments. For example, they pay the bill for the meal using a QR code and get a voucher to go to any nearby shop or movie place. This kind of partnership not only improves the relations with customers but also opens extra opportunities for marketing for the restaurant and, therefore, additional sources of income.

Improved Customer Understanding and Data Analysis

QR code payment integration is also a way for restaurants to obtain much information about their customers and use data analytics [27]. Since payment is tied to the user's profiles and the customers' loyalty programs, restaurants get hold of significant data such as how often customers visit the restaurants, how much they spend on average, what meals they tend to order, and even how they prefer to pay for their meals. These conical data can then be quantified, summed up, and analyzed to bring out features that restaurant business units can use to make more rational business decisions.

This is because by analyzing the data in detail, a restaurant finds out that certain food products are ordered more frequently by customers using Apple Pay or that six out of the five times a week, lunch traffic primarily comprises more frequent customers using

their reward points. Based on this information, the restaurant can consider changes to the existing menu, promotions, new products to introduce, or even better staffing to offer customers better value and increase revenues accordingly.

The restaurant can send automated marketing campaigns when the QR code payment method is linked with marketing and customer relationship management information system [28]. For example, when a customer uses Apple Pay and gets some loyalty points, he will get an Email in minutes with a code for a discount next time. This customer segmentation makes the interaction with the customer more personalized and improves the restaurant's capability to retain the customer.

It further writes 'The means to monitor and quantify customer behavior at this level gives restaurants a significant edge.' That is why such decision-making, based on the modern tools available for the restaurants to cater to the needs of the consumers, allows quick reactions to changes in consumers' preferences and constant improvement of operations. The adoption of QR code payments is a relatively new payment model, and the incorporation of data analytics will be a critical enabling factor in the advancement of restaurants in the digital frontier.

Case Study: Metro Eats Dinner

Table 3: Metro Eats Case Study Results

Metric	Pre-Implementation	Post-Implementation	% Change
Mobile Wallet Usage	15%	65%	+333%
Payment Errors (monthly)	70 errors/month	21 errors/month	-70%
Transaction Time (avg. per customer)	4 minutes	1.5 minutes	-62.5%
Throughput During Peak Hours	100 transactions/hour	112 transactions/hour	+12%
Customer Satisfaction	78%	91%	+13%

Background

A few issues in the COVID-19 crisis occurred in one fast-growing mid-sized cafeteria franchise called Metro Eats, which had outlets in several metropolitan regions. The firm's traditional card-based payment system felt pressure from the rising customer preference for contactless payments and a growing number of takeaway orders. Furthermore, staff members had to manually enter card details for delivery and pickup orders, which caused new mistakes, time consumption, and lower customer satisfaction.

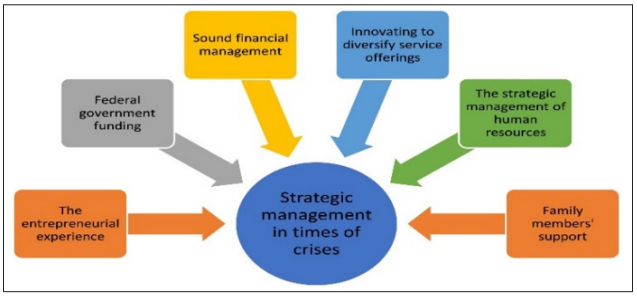

Figure 7: Strategic Management during Crises

The Challenge

Due to the effects of the COVID-19 pandemic, firms, regardless of their sector, such as the restaurant industry, are forced to encounter specific challenges. Values that some people enjoyed when visiting restaurants were changed when client interactions were considered unsafe, as evident by Metro Eats restaurant chains [29]. With the emergence of the virus, clients and employees became concerned about the possibility of contracting the disease while paying with cards or cash. Not only did the germs transfer, but these transactions demanded touch-banking on payment terminal devices, which, in restaurants and businesses, other people touching it exposed them to the virus.

Besides the health effects, traditional payment methods were also inconvenient due to the time taken, mainly during rush hour [30]. Cards had to be taken by servers, the information was to be entered into the payment terminals, and then the card was returned to the customer, which was very time-wasting time-wasting. This process considered customers' time at checkout and formed bottlenecks, hindering table turnovers and significantly limiting restaurant customers per turnover ratios. Collectively, these problems demonstrated a safer, faster, and more efficient Payment Instrument.

To address these issues, Metro Eats saw the necessity of implementing a system to increase the security of the transactions and further complement customers' experience. The restaurant wanted to adopt a solution for a contactless payment method, which seemed convenient for the current generation because of the change in their lifestyle due to COVID-19. The customers did not want physical contact with money or cards and decided they could use their phones to purchase. Due to such changes in attitude, understanding, and consumer expectations, these changes had to be implemented to suit Metro Eat's business objectives.

QR Code Payments, a Mobile Payment Method, has been Introduced

That is where Metro Eats hit the jackpot when they decided to incorporate QR code payments that are compatible with Apple Pay and Google Pay. This innovative payment system enabled customers to make payments without any hassles; they only needed their receipts, which had a QR code that the customers' mobile devices could scan. After a quick scan of the code, the customer could safely pay for the product using their mobile wallet. There was no longer any paperwork concerning physical cards, thus enhancing the security of payments for the customers and staff and improving the efficiency of payment processes.

QR code payments allowed Metro Eats several main advantages for its successful functioning. First of all, it eliminated the most pressing health-related issues by ensuring that there was a fully contactless transaction flow. Elimination of contact has been effected by, for instance, customers no longer having to pass their cards to servers or use commonly touched payment devices. Instead, they could complete the payment process on their hand-held devices more securely and faster with little to no exposure to the virus. The new system promised customers that Metro Eats was doing everything possible to ensure their health and safety were in check; hence, more clients were dining in without having to contact much.

The QR code system was combined with Apple Pay and Google Pay, two consumers commonly use. In this way, due to these established and familiar platforms, Metro Eats could provide

customers with a payment option that many would already use. It made the change to the new system relatively easy and seamless for the customers since it involved adopting mobile wallets that are friendly and easy to use daily.

Improved Efficiency and Speed of Service

Therefore, one of the greatest strengths of the QR code payment system was that the time taken to execute transactions could be considerably sliced. Before, simple actions such as storing a card, waiting for the card owner to swipe or insert the card, and finally returning the card might have taken several minutes, mainly during rush hours. It takes only a few seconds to complete the procedure in QR code payments. Customers can scan the code and approve the payment on the handheld device, thus making the process quicker than other traditional methods.

This speed was a big plus to the company's operations, especially during peak times when the turnover of tables was of paramount importance to Metro Eats. Faster payments meant that customers were not around waiting at their table, especially when their meals were done, and this made it possible for the Restaurant to serve more heads simultaneously. This means there was an improvement in the circulation of tables, which led to an enhanced total clientele turnover. Since this improved the Restaurant's service delivery speed, this was not only advantageous to the customers but also helped to increase the Restaurant's revenues as Metro Eats was able to attend to more guests during the day.

More importantly, the faster checkout process also burdened the Restaurant's men and women, who no longer had to count money manually, let alone handle the cards. This kept the servers more attentive to the customers, enhancing the quality of the dining services offered. The reduction of time taken during the transaction process brought about by the use of the platform was channeled towards improving service, which enhanced the efficiency and quality of service offered by Metro Eats [31].

Enhancing Customer Satisfaction

Integrating the QR code payments visibly improved customer satisfaction levels at Metro Eats' operation. The system provided the flexibility and convenience of payment that cater to the new generation consumers' demand with additional technological advancements. Lifestyle emerged as a reason for adopting mobile wallets that pay convenience with the expectation of similar convenience in all areas of life, including eating practices. Taking quick, contactless, and secure payments became a plus compared to these expectations, creating a more enjoyable eating experience for Metro Eats' customers.

It also fulfilled the need for self-service, as revealed by the many customers who embraced the QR code payment system. Some customers also liked the freedom of self-serving, whereby they did not have to wait for the server to bring the payment terminal to effect their payments. This notion of self-service was done as it helped customers gain more control over their dining services. If customers wanted to make their payments fast or were the kind who wanted to spend less time at the till, then QR code payments were suitable for them.

Metro Eats added the feature of secure payment platforms such as Apple Pay and Google Pay, which increases the customers' trust in the application. These platforms are renowned for their high levels of security, owing to the use of solid encryptions and biometric means of authentication of users before any transaction takes place. The customers also appreciated the second level of security and the assurance they received after every transaction they made that their financial details were safe.

Ways of Increasing Revenue through Increased Efficiency

Reducing the time spent adapting QR code payments increased the Restaurant's revenues, as identified in the Metro Eats case [32]. By cutting down on the amount of time spent helping customers and the number of turns a table went through in serving customers, a restaurant could serve more customers, especially during a rush period. Increased accommodation capacity was also directly proportional to the increase in sales since the Restaurant increased the number of customers it attended within the same period.

Besides improving customer flow, the existing payment system has helped to eliminate congestion at critical sales points, especially during certain hours of the day [33]. This decrease in waiting time minimized customers' possibility of getting annoyed or leaving without paying. The availability of faster and more efficient service generated positive feedback; customers could come back and recommend Metro Eats to others, thereby increasing revenues.

Adopting QR code payments created pathways for future earning possibilities to appear and be used. After implementing the system, Metro Eats could incorporate loyalty programs and promotions, such as special offers, into the QR code, encouraging people to visit more and increasing customer loyalty. This flexibility meant that the QR code payment system would continue positively impacting the Restaurant.

Long-Term Benefits and Future-Proofing

In implementing QR code payments, Metro Eats portrayed the company as willing to constantly shift to the modern market, especially in the mining industry [34]. COVID-19COVID-19, which happened globally, showed that contactless solutions were not just the so-called trend but the new normal for customers. One of the pioneers in using QR codes in the restaurant business, Metro Eats, has protected the Restaurant from behind the increasing trends of digital, contactless, and safe payment methods for several years.

The QR code payment system is more adaptive and allows for expanding the company's services as Metro Eats is challenging. It is also scalable to multiple locations and can include further features, including rewards programs, special promotions, or targeting based on individual location data. This scalability means that the business is not locked into a specific model of appealing to customers and delivering services that can arise from future changes in customer demands, the availability of technologies, or trends.

Metro Eats' decision to utilize QR code payments solved the most pressing issues regarding safety and effectiveness and intended to yield considerable long-term advantages for the Restaurant's operation, customers, and profits. Since the adoption of no-contact payments is now the norm in the mining sector, Metro Eats will be ideally placed to become the trendsetter in this new normal.

Reduce Manual Entry Errors and Associated Payment Delays

This mainly occurred when the staff had to enter card numbers for orders of take-out meals or entered payment details written in cash registers during rush hours, causing errors to go unnoticed. These produced consequences, which included delays. This was not only bad for the customers but also for the unhappy employees. Misrepresentations of charges declined transactions, and having to fix mistakes made the straightforward process of a monetary

exchange unnecessarily complicated. Manual errors play a very negative role in the chain of restaurants, and hence, to overcome this circumstance, the company Metro Eats realized that these problems had to be solved.

QR code payments helped to eliminate the problem of entering the card's data, which can lead to mistakes. Instead of a server having to type in the customers' payment information manually, customers directly scanned the QR code for mobile checkout. However, that automated approach also reduced payment errors and accelerated the payment process, resulting in fewer payment disputes and requirements for payment corrections.

Through the decrease in payment errors, it was found that customer retention was beneficial. Because there were fewer errors, customers savored their checkout process, while the personnel spent little time-solving problems with the checkout systems. This enhancement in organizational performance was helpful for the employees to spend more concentrated time on quality service delivery without solving avoidable payment-related issues, thereby providing an enhanced dining experience to the customers at Metro Eats.

Provide a Scalable Payment System Across Multiple Locations
About Metro Eats Metro Eats is a fast-growing dinner restaurant chain. Because the number of restaurants in the chain continues to grow aggressively, it needed a payment solution that could be integrated across the network. The restaurant had to branch out to other cities based on the situation. When opening new branches, the restaurant needed a consistent payment system that could be rolled out to other branches without disrupting operations. The problem was identifying a system that would meet the existing requirements and be scalable as the business expanded.

By using QR codes for payments, Metro Eats benefited from scalability. The organizational structure of the QR code integration was highly modular. Thus, it was relatively simple to implement in multiple outlets due to the Go programming language and cloud deployment. Every branch could directly implement the new payment technology as it did not impose extraordinary modifications on its POS systems and networks. This kind of approach was centralized and easily scalable. Thus, all Metro Eats shops could provide the same contactless payment experience.

Thus, the QR payment method is beneficial for future development while keeping the structure of the slow-growing Metro Eats. Because the system was centralized, it became easy and efficient to make updates, customizations, or improvements and have them rolled out in all the locations [35]. This flexibility, which I have seen in Metro Eats, allowed the company to always adapt to new technologies quickly enough in the payment systems while at the same time ensuring standard service delivery to all restaurants in the network.

Implementation of QR Code Integration: Implementation of QR Code Integration
Chimpreports has noted that to explain how food delivery startup Metro Eats works, the company started using QR code payments across all its locations, integrating Apple Pay and Google Pay into customer receipts. To do this, the restaurant chain engaged Go in writing ESC/POS commands, which enabled printing QR codes on the receipt. This way, the store's customers could quickly scan the code using their smartphones, irrespective of whether iPhone users support Apple Pay or Android phone users support Google Pay-mobile payments were thus possible immediately. This meant that, apart from increasing the efficiency of transactions, this system also achieved the goal of the contactless payments many patrons and clientele desired, avoiding the physical handing over of cards.

The essence of this integration was built upon the solid ergonomics of ESC/POS commands commonly used for controlling the receipt printers. With the help of these commands in Go, Metro Eats was anticipating compatibility with the earlier equipment it used so that it would not have to spend a lot of money on improving the equipment. This made the change easy and cheaper since the system was integrated across the various locations and with minimum interferences. Further, the QR codes on receipts were designed for a secure mobile wallet to provide customers with an easy and effective payment journey.

Security was a key area of focus of this implementation, and the integration of VTS was vital in making secure transactions [36]. If a customer decided to scan a specific QR code, the respective payment data were directed through the VTS system securely through the encrypted links. This secure processing eliminates the usual threats of card-not-present transactions, including fraud and data theft. For Metro Eats, it afforded their clients a quicker and more secure way of payment.

Results
Metro Eats noticed a 65% increase in mobile wallet usage after adopting the QR code payment system in six months. The diner chain also experienced a 70% improvement in payment-related errors, mainly because card entries for orders were no longer done manually. The customers have responded positively to the changes and expressed hard and fast that the new payment method is easy to use. This was, therefore, positive for Metro Eats as it experienced a 12% improvement in the time it took to complete transactions during high-traffic periods, thus enhancing customer turnover and overall revenue.

Future Plans
Recently, there have been discussions about taking the QR code system from the company and including it in Metro Eats' loyalty program. Users of Apple Pay and Google Pay get points with every payment that they make. This will be an added advantage for repeat business and help the chain build a good relationship with customers.

Conclusion
The combination of QR codes with Apple Pay and Google Pay revolutionized the restaurant payment system. This advancement provided a perfect, safe, non-contact, one, and done payments processing solution that not only addressed the emerging issues of manual payments but was also an ideal fit with changing trends in digital and mobile payments. The change allowed for a notable optimization in the flow of operations, especially for restaurants that wanted to improve the efficiency of both the front end for the customers and the back end for those managing the restaurant. Introducing this technology was evidence of the progressive mentality because it offered restaurants the appropriate solution that caters to the contemporary consumer's direction.

A notable improvement of this implementation was discovered to be the sixty-two percent increase in scan-and-pay transactions. This sharp rise demonstrated a trend of increased penetration towards Mobile wallets and contactless payment systems in general, as was observed across industries where consumers

adopted new digital payment systems for more efficiency. This was mainly a relief for restaurants as it helped decrease some of their employees' workload and increase the speed and efficiency of transactions. This was felt in the QR code payments, where the customers demonstrated how they could quickly adapt to a mobile-based system, thus revealing what the dining industry payments would be like.

The technical support of this system played a crucial role in its success. To double-barrel this, though, by using ESC/POS commands within the Go programming language, developers ensured that the solution would be highly malleable to existing receipt printer hardware, thereby minimizing costs to restaurants for implementation. The fact that the formats of the receipts were easily customizable and that the QR codes could be generated dynamically at the place of receipts made the system very elastic and, therefore, could easily be implemented by restaurants regardless of their sizes. In addition, the smooth interface with the Virtual Terminal Service (VTS) system ensured that payments were processed as securely as possible, always using the highest security standard achievable.

With an increasing number of restaurants using contactless payment solutions, the number of touchless payment systems is still going to rise. There is a possibility to expand the proposed solution, such as adding loyalty programs, individualized offers, and promotion tools that bring more value to the dining experience. Thus, this future potential opens enticing opportunities for restaurants and their ability to optimize the payment system and improve and personalize their relationship with customers. For this reason, this particular solution will always prove relevant in an independent restaurant and a group of restaurants.

The following are some of the effects of QR code payments on restaurant operations: By minimizing input errors, making the reconciliation process easy, and increasing the number of transactions offered, restaurants can improve their operations and cut out peak-hour log jams. This efficiency has a clear line that goes straight to enhancing customer satisfaction. Hence, revenues will be improved since more bills paid means more turns on the tables. Furthermore, the information gathered from QR code transactions can be used to analyze customer trends in restaurant operations and make specific changes to product or service provision and marketing promotions.

In conclusion, using QR codes combined with Apple Pay and Google Pay has become one of the greatest innovations in restaurant payments. As it has been observed that the consumer trend towards fast, secured, and contactless payments increases, restaurants adopting these technologies will have the added advantage of addressing customers' expectations. Technical advancement and accompanying practical, efficient, and easy-to-use concepts ensure that QR code payments will be important in constructing the future tone of dining services, where customers and restaurants will enjoy a more secure and effective transaction process.

References

1. Cavusoglu M (2019) An analysis of technology applications in the restaurant industry. Journal of Hospitality and Tourism Technology 10: 45-72.
2. De Vries J, Roy D, Koster R (2018) Worth the wait? How restaurant waiting time influences customer behavior and revenue. Journal of operations Management 63: 59-78.
3. Rawal YS, Pal S, Bagchi P, Dani R (2020) Hygiene and safety: A review of the hotel industry in the era of COVID-19 pandemic. Bioscience Biotechnology Research Communications 13: 79-83.
4. Goel P, Garg A, Sharma A, Rana NP (2022) I won't touch money because it is dirty: examining customer's loyalty toward M-payment. International Journal of Bank Marketing 40: 992-1016.
5. Patil S, Kodarlikar S, Marathe S, Chandran DV (2022) Touchless Ecosystem Using Hand Gestures hand 9.
6. Kimmes JF (2020) Peer-to-Peer Transactions for Privacy-Preserving Mobile Payments using GNU Taler https://taler.net/papers/jfk2020thesis.pdf.
7. Liu W, Wang X, Peng W (2020) State of the art: Secure mobile payment. IEEE Access 8: 13898-13914.
8. Hanif H, Sutopo H (2019) Developing QR payment to enhance the technological service in sederhana restaurant network. In Proceedings of the 2019 3rd International Conference on Computer Science and Artificial Intelligence 128-132.
9. Enwereji PC, Marius Portgeiter (2019) A payment culture framework for municipal services in the North West province (Doctoral dissertation, North-West University (South Africa)) https://www.researchgate.net/figure/Payment-culture-framework-for-municipal-services_fig3_345912929.
10. Zhong Y, Moon HC (2022) Investigating customer behavior of using contactless payment in China: A comparative study of facial recognition payment and mobile QR-code payment. Sustainability 14: 7150.
11. Mills K, McCarthy B (2016) The state of small business lending: Innovation and technology and the implications for regulation. Harvard Business School Entrepreneurial Management Working Paper 17-42.
12. Liu J, Kauffman RJ, Ma D (2015) Competition, cooperation, and regulation: Understanding the evolution of the mobile payment's technology ecosystem. Electronic Commerce Research and Applications 14: 372-391.
13. Agrawal S (2021) Integrating Digital Wallets: Advancements in Contactless Payment Technologies. International Journal of Intelligent Automation and Computing 4: 1-14.
14. Lou L, Tian Z, Koh J (2017) Tourist satisfaction enhancement using mobile QR code payment: An empirical investigation. Sustainability 9: 1186.
15. Thoi M (2016) Exploring merchants' adoption of mobile payments a qualitative study on swedish merchants' perspectives (Master's thesis) https://gupea.ub.gu.se/handle/2077/47560.
16. Othuon KD (2018) Improving customer shopping experience using an Android bar-code reader application (Doctoral dissertation, Strathmore University) https://su-plus.strathmore.edu/items/0c5eb2e3-631f-414e-a395-3ed3943f3655.
17. Shen H, Faklaris C, Jin H, Dabbish L, Hong JI (2020) 'I Can't Even Buy Apples If I Don't Use Mobile Pay?' When Mobile Payments Become Infrastructural in China. Proceedings of the ACM on Human-Computer Interaction 4: 1-26.
18. Paul R, Bhandopia RR, Patil DR, Raut DJ, Gotmare AD (2020) An Efficient Digital Ordering System for Restaurant. International Journal of Research in Engineering, Science and Management 3: 391-395.
19. Iana K (2017) Full-Service Management Restaurant Information System Selection Model https://dspace.spbu.ru/handle/11701/9536?locale=en.
20. Kosse A, Lu Z, Xerri G (2020) An economic perspective on payments migration (No. 2020-24). Bank of Canada Staff Working Paper https://www.econstor.eu/bitstream/10419/241190/1/swp2020-24.pdf.

21. Saffady W (2021) Records and information management: fundamentals of professional practice. Rowman & Littlefield https://archive.org/details/recordsinformati0000saff.
22. Garibaldi LR (2015) When Food Becomes Money: Care and Belonging in a Fijian Village. University of California, Riverside 11: 56-71.
23. Swartz L (2020) New money. Yale University Press https://yalebooks.yale.edu/book/9780300233223/new-money/.
24. Renieris EM (2021) What's really at stake with vaccine passports. Surveillance & Privacy https://www.cigionline.org/articles/whats-really-stake-vaccine-passports/.
25. Zhang S, Liao J, Wu S, Zhong J, Xue X (2021) A traceability public service cloud platform incorporating IDcode system and colorful QR code technology for important product. Mathematical Problems in Engineering 1-15.
26. Intal GL, Payas JD, Fernandez LM, Domingo BM (2020) Restaurant information system (RIS) with QR code to improve service operations of casual fine dining restaurant. In 2020 IEEE 7th International Conference on Industrial Engineering and Applications (ICIEA) 1054-1059.
27. Alormene CK (2022) Restaurant Management System for KAS Valley Restaurant. https://air.ashesi.edu.gh/items/5cc15ac9-870f-4bec-8e69-d1d59376e068.
28. Nel J, Williams A, Steyn R, Hind C (2018) Customer experiences and expectations of sit-down restaurants: An auto-ethnographic perspective on restaurant failure. African Journal of Hospitality, Tourism and Leisure 7: 1-16.
29. Jin X, Fan M (2022) I Used To Carry A Wallet, Now I Just Need To Carry My Phone: Understanding Current Banking Practices and Challenges Among Older Adults in China. In Proceedings of the 24th International ACM SIGACCESS Conference on Computers and Accessibility 1-16.
30. Chaudhari JD, Bhangale MN, Patil DS (2022) Impact Of Digital Transformation: To Analyze How Digital Transformation Has Transformed The Life Of Street Hawkers In Jalgaon City. Kavikulaguru Kalidas Sanskrit University 116.
31. Swink M, Hu K, Zhao X (2022) Analytics applications, limitations, and opportunities in restaurant supply chains. Production and Operations Management 31: 3710-3726.
32. Kellner F (2016) Insights into the effect of traffic congestion on distribution network characteristics–a numerical analysis based on navigation service data. International Journal of Logistics Research and Applications 19: 395-423.
33. Bessen J (2022) The new goliaths: How corporations use software to dominate industries, kill innovation, and undermine regulation. Yale University Press https://scholarship.law.bu.edu/books/126/.
34. Lanza G, Peukert S, Steier GL (2022) Latest advances in cloud manufacturing and global production networks enabling the shift to the mass personalization paradigm. In Design and operation of production networks for mass personalization in the era of cloud technology 39-77.
35. Uyà Juncadella À (2022) Vessel Traffic Services, towards e-Navigation: the role of Oceanic VTS in global maritime surveillance https://upcommons.upc.edu/bitstream/handle/2117/370239/TAUJ1de1.pdf;jsessionid=ABC9A2CEF0AD425E65E2553427C7F8AC?sequence=1.
36. Kimmes JF (2020) Peer-to-Peer Transactions for Privacy-Preserving Mobile Payments using GNU Taler https://taler.net/papers/jfk2020thesis.pdf.