Final Report

Kiosk Order Process System

Improving order process with information technology: McDonald's Case

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EXECUTIVE SUMMARY

Objective

McDonald's kiosk order process as outlined in figure 1 of the appendix displays the customer order process, focusing specifically on the kiosk system at any McDonalds branch. This report will identify areas of improvement and constraints which hinder the order process; moreover, alternative solutions will be presented which outline steps in which McDonalds can improve the current process to reach the desired state with a newly recommended strategy. Technology innovations will also be a focus in determining how they can enhance the current order process. This report will include a thorough top to bottom review outlining the amendments that are deemed necessary in order to augment the customer experience and order process.

Scope

The scope of the project is clarified by the below list which outlines which aspects of the kiosk order system will be in-scope or out-of-scope. The items in scope will be expanded on throughout this report. The end result will assess the current dynamic of the order process system with the kiosk and recommend what steps can be taken to remove redundancies in the current system and increase efficiency.

In-Scope

- Developing cash payment system which can be integrated into the existing kiosk
- Integrate guest assistance and employee "master user" status
- Developing hardware and software for automated inventory management
- Replacing barcode scanner with QR scannable code
- Implementation of table booking system along with space optimization plan
- Develop accessible kiosks to accommodate all users implementing assistive devices
- Implement customer profiles which enable recommendations based on customer data analytics

Hardware

- Developing hardware for automated inventory management.
- Replace barcode scanner with QR scannable code.
- Develop portable kiosks to be placed on each table.
- Develop accessible kiosks to accommodate all users implementing assistive devices

Software

- Developing software for automated inventory management.
- Update cash payment software which can be integrated into the existing kiosk.
- Create new internal software for employee “master user” status.
- Implement accessibility accommodations within Kiosk software.
- Develop customer profiles which enable recommendations based on customer data analytics

Process

- Developing a cash payment system which can be integrated into the existing kiosk.
- Integrate guest assistance and employee “master user” status
- Implementation of table booking system along with space optimization plan

Out of scope

- Cashier payment
- Order Handshake
- Table tag system
- Mobile app synchronization
- Development of the subscription service
- Restaurant operating system (physical and IT)

Major Findings

This report has been prepared with a focus on upgrading the McDonalds kiosk order process while seeking to improve the McDonalds process flow and increase user satisfaction. The report takes a deep dive into the new and updated kiosk system that addresses any flaws, areas of improvement and customer pain points of the previous kiosk order system. Through online and in-person research, various issues and solutions have been identified in the McDonald’s kiosks which can be addressed if strategies from nearby industries are applied.

Implementing a table booking system is a way to optimize the order process by ensuring the customer’s impact on the process is reduced and more focus is on the system. Customers will be able to reserve their seating at free will according to the availability of seats and the use of table tags will not be necessary.

Establishing an employee as a master user will enable employees to intervene where an order failed due to a kiosk system crashing. This would avoid customers having to restart their order

and eliminate the risk of them leaving the store or becoming frustrated as the master user can push through orders using a tablet and accept payments through a designated kiosk cash register or a portable payment terminal.

To improve the payment process and quality of service, a new cash payment option at the kiosk will be implemented in order to prevent customers from lining up to order with an associate each time. If the system accepts the cash, it will proceed to the ordering process and if the system rejects the cash, it will offer alternative payment options.

Implementing new technology such as QR code scanners and cash payment options into the Kiosks would enable customers to pay at the kiosks instead of re-entering the line after placing their order. Essentially, this would transform the two step process to a one step process.

Designating separate areas for kiosk orders within the floor plan of the store will remove the risk of cashier lines overlapping with kiosk lines. Additionally, having a separate kiosk pick up counter would keep areas of the store from becoming overcrowded and increase accurate delivery of orders to the respective customer. Accepting cash payment at the kiosk would remove a redundancy from the process where a customer has to re-enter the line to pay at the cashier.

Installing dispensers to automate simple processes such as dispensing soft drinks and specific desserts such as ice cream can be implemented which will reduce the margin or error that is sometimes encountered when employees are overwhelmed with many orders. The kiosk system can significantly increase revenues and

Additionally, automating the inventory management will reduce the manual effort required by the manager to count the inventory and place orders. The manager will no longer be the trigger to order additional items. Instead it will occur once the inventory system is sent out an alert. The alert will be sent out when the inventory falls below a specified threshold.

Key Conclusions

The key conclusions this report will cover are as follows. The kiosk process is inefficient, slow, unreliable and has major security concerns. We can see the inefficiency when the customer has to input the table tag information, and line up again to pay using the cash option. Likewise this report highlights the fact that the slowness in the Kiosk process is caused by the location of the kiosk and additional time it takes to line up to pay at the cashier. This report will propose plans and strategies for rollout as well as costs associated with developing the newer technologies.

The inventory management system needs to be automated because it relies heavily on human interaction. Supervisors and employees must manually count inventory and record it into the system each shift. We have proposed a change where the process is automated and the order

flows efficiently. We have proposed a new inventory system which will monitor customer demand more effectively, more real-time stock updates, reduce operating costs, and reduce risks entirely.

The new “Customer Kiosk Access Process” will quicken the fast-food experience customers want by dividing potential customers into those that want to dine-in and those who would like to get take-out. This will assist McDonald reach its goal of retaining, regaining and converting its customers.

The portable table tablet will be a new piece of technology proposed. The kiosk will cater to the issue of space optimization in the restaurant and avoid interactions with the cashier. These tablets will be located at tables and the portable tablets will allow customers to order meals directly to their table.

The new Scannable QR code that will be replacing the barcode scanner enables customers to have a more custom-tailored experience. Implementing this QR code system where customers can scan using the mcDonald’s app will reduce the security risk of potential hackers while increasing the use of the McDonald’s application.

We have also proposed features that should be added into the kiosk to further improve customer experience. The implementation of a cash dispenser and a table booking system are key investments proposed in the report. Kiosks allowing customers more flexibility in their experiences is beneficial to McDonald’s because it shows that they are adapting to popular trends.

BACKGROUND

Studies say one in four technology native millennials prefer using the kiosks over the cashier. “26% of millennials and 16% of customers overall want to be able to pay at self-service kiosks” (Akcam, 2020). The purpose of this report is to improve the current Kiosk business process system whether that be to modify already existing processes or to create entirely new ones. This report will highlight the current business process system and also the new improved business process used by the McDoanld’s Kiosk systems. Our team researched and identified the current business process. We used a Use Case Diagram to get an overview of the current interactions the McDonald’s Kiosk system undergoes. Furthermore, with some field research we were able to create a Business Process Model and Notation diagram. This provided an insight of how the Kiosk system will work and where it can be improved. McDonald’s is actively seeking to retain, regain and convert customers. The best way to do this is improving the current Kiosk business process system. In this report we will present a new and improved BPMN model. After

researching the kiosk industry across North America, we determined how the McDonald's kiosks could be improved to match the standards of similar industries.

Currently, McDonald's has been successful with the Kiosk process system making it different from other fast foods and setting a standard for the industry. McDonald's was able to increase its revenues and easily upsell products through the kiosk system. During peak hours McDonald's was able to speed up the process. The structure of this report is as follows, we will discuss the existing process of the Kiosk using the current BPMN model. This will be followed by the process redesign where we will present you with an improved process of the kiosk. In this section we will highlight the GAP analysis and the Key Performance Indicators. The next section introduces various prototypes that can be used to accomplish the new process. Finally we outline an implementation plan for the proposed prototypes and new business processes. The purpose of this report is to show what improvements McDonald's can implement in their Kiosk order process.

EXISTING PROCESS ANALYSIS

COMPANY PROFILE

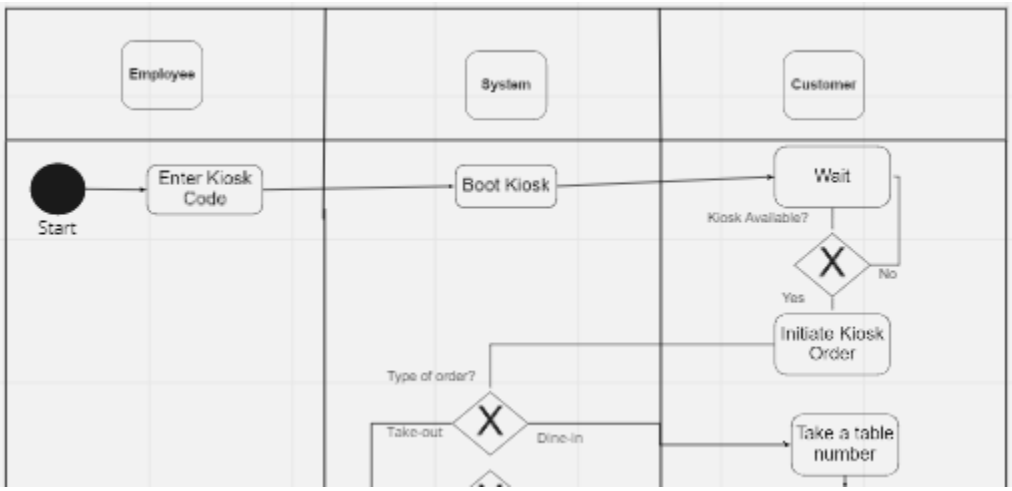
The company that this project focuses on through in depth analysis is McDonald's. The food chain started off as a single small-sized business in California and has now grown to more than 36,000 restaurants in more than 100 countries. In 2019, McDonald's generated a total revenue of 21.08 billion USD. The first restaurant outside of the U.S was opened in Richmond, British Columbia, Canada. The impact on the Canadian economy is substantial, generating nearly $4.5 billion and producing 200,000+ jobs on an annual basis.

McDonald's started implementing Kiosk in Canada and the U.S. as a new way to start implementing technology. This has had a great impact, as the CEO Steve Easterbrook says customers spend more when ordering through the Kiosk (Patton, 2019).

EXISTING PROCESS

The process that we have selected to improve is the McDonald's kiosk order process. This process, shown in Figure 1 of the appendix, involves interactions between the following actors: the customer, system and the employee. The actors present are the customer and the employee.

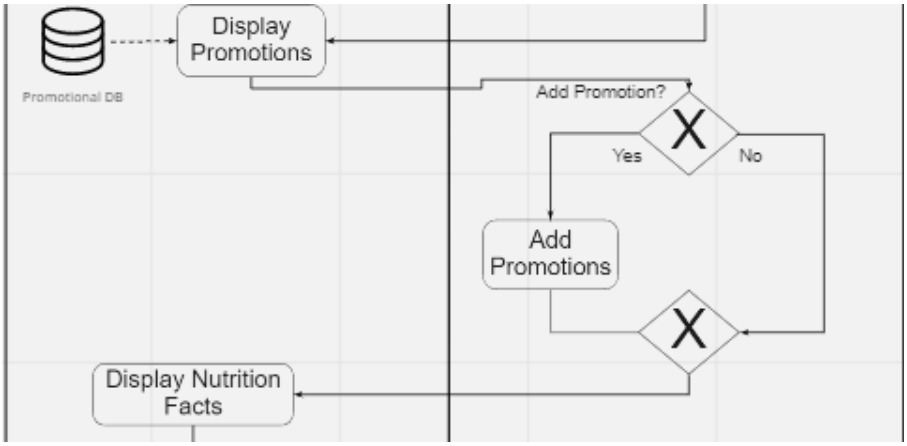
The process is triggered by the employee when they boot the system with its specific code. When the customer chooses to order, the system will exit sleep mode and require the customer to make a decision-- dine in or takeout (XOR gateway). If the customer chooses to dine in the restaurant, they would enter the table tag they obtained into the kiosk. These table tags are kept near the kiosks, easy for the customer to acquire. Alternatively, customers can also choose the takeout option.



Both dine in and takeout customers are now given the option to use coupons they have acquired by the system (XOR split: yes or no). If the customer chooses to use the coupons, they would scan them, and then the system would proceed to display a menu of items available to order.

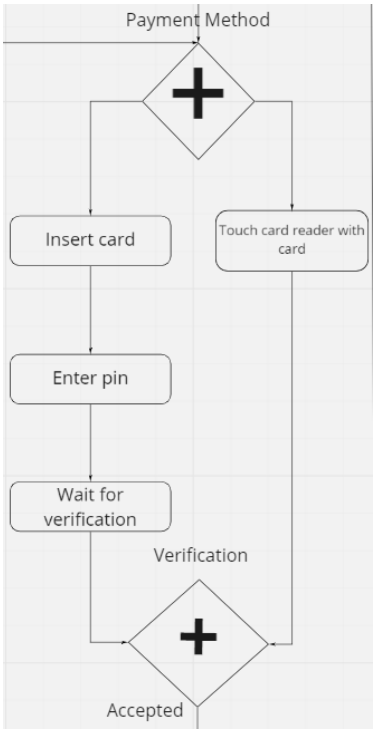
The menu of items is listed from the inventory database. The inventory is constantly updated by the manager on duty, and the system would update the kiosk, and list only items available for the customer's choosing. The customer would then select items they are interested in.

Subsequently, the system would display any specific promotions for the items chosen, courtesy of the internal promotional database. Management would update the internal promotional database when new promotions are being marketed. The customer must now make a decision based on the promotion: add promotion (yes or no). At times, customers would decide not to add the promotion because they would have to upsize and pay more (combos, free drink if you upsize, etc.)



After the XOR split completion, the system would display the nutritional information of the order, and then proceed to checkout, but also allowing the customer to loop back to add additional items. The system would then proceed to the select/verify payment subprocess, as shown in Figure 2 of the appendix.

Select/Verify Payment Subprocess: Once the customer is satisfied with his/her order, they select checkout. This cues the system to display the available payment options: debit/credit or cash. Both options are displayed as an exclusive split. If the customer chooses to pay in cash, they proceed to the cash register to pay. Alternatively, the system is required to accept a debit/credit card and proceeds to the payment method.



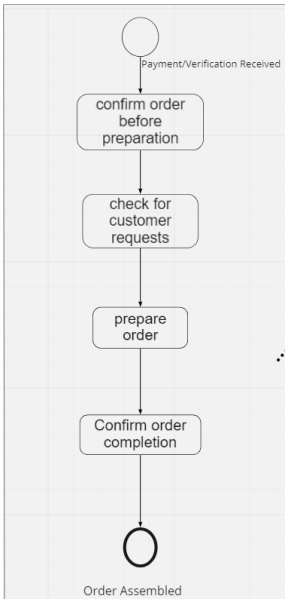
Once the customer arrives at the counter to pay in cash, the employee verifies the order with the customer, accepts the payment, and the system verifies the payment. If the customer is not able

to pay the correct amount in cash, the employee returns the cash, and requests an alternative payment (exclusive split). If an alternative payment is not available, the employee cancels the order. If an alternative payment is available, the system requires the customer to pay debit/credit. Now, a payment method is required.

Following the payment method, two sets of tasks occur simultaneously. In the first set of tasks, the system requires the customer to insert their card, enter the pin, and wait for verification. In the second set of tasks, the system requires the customer to simply tap their card on the card reader. After both sets of tasks are completed, verification of the card is determined. Following verification, the system accepts the customer's payment, and payment is verified by the system like the cash payment.

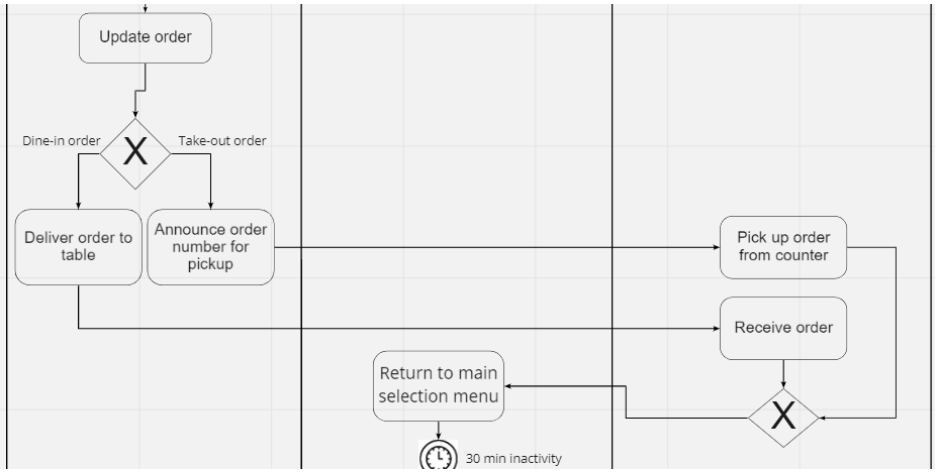
Followed by selecting and verifying the payment, two sets of tasks occur in parallel. The first set of tasks include order assembly, shown in **Figure 3** of the appendix, which is completed by the employee.

Order Assembly Subprocess: Once payment has been processed by the system, the employee will begin to assemble the customer's order. Firstly, the employee confirms the order before preparation to avoid any unnecessary mistakes. Moving on, they check for any special requests made by the customer. Next, the order is prepared by the employee. The employee then confirms that the order is complete. With this, the employee has successfully assembled the order.



Once the customer completes their order at the kiosk, the receipt is printed, one copy is provided to the customer while another is retained by the employee. The kiosk will then return to the main menu display. Next, the employee will receive the order and must determine if the specific order is dine-in or take-out (exclusive split). If the order is dine-in, the employee must deliver the order

(based on the table number). If the order is take-out, the employee must announce the order number specific to the customer for them to come pick up at the counter.



PERFORMANCE ASSESSMENT

Space Optimization

The current existing process for the kiosk order process starts when the customer chooses to order, the system will exit sleep mode and require the customer to make a decision-- dine in or takeout (XOR gateway). If the customer chooses to dine in the restaurant, they would enter the table tag they obtained into the kiosk. These table tags are kept near the kiosks, easy for the customer to acquire. Alternatively, customers can also choose the takeout option. Both dine in and takeout customers are now given the option to use coupons they have acquired by the system (XOR split: yes or no).

The current space optimization within McDonalds is currently underutilized in the placements of the Kiosks and the lines that are formed as a result. Currently, McDonald's Kiosks are placed close to the front of the restaurant near the cash register and the food pick up location. Customers must form a line in order to use the Kiosk no matter if they are choosing the dine or take out option. This means longer lines and crowded stores which leads to a decline in sales and customer satisfaction.

Space optimization is important as it not only allows for better service towards customers but a better working environment for employees. Space optimization improves workplace culture and productivity, decreases operating costs, increases comfort for customers and allows for growth. Recent studies showed that increased space optimization leads to 5% average incremental revenue increases and a 20% increase in customer loyalty. For optimal space utilization, fast food chains must split their kitchen/prep and seating area 60% and 40% respectively with 11-14 square feet reserved per customer (Lopez, 2020).

Currently, McDonalds requires its restaurants franchisees to have a minimum of 4000 square feet, for a traditional 50000 square foot site. However, McDonald's restaurants located within major cities in downtown locations have differing size requirements that are well under the optimum 11-14 square feet per customer requirement. This results in many customers forming lines and consuming scarce floor space with many of the seating capacity not being utilized, resulting in lost sales, increased operating costs, and increased customer dissatisfaction. Currently, the kiosk layout at Cineplex consists of two separate locations which ensures that the lines do not overlap. This creates a clear differentiation between two lines and does not confuse the customers to who is in line and who is ordering.

Restrictive Payment Options

Once the customer is satisfied with his/her order, they select the checkout. This ques the system to display the available payment options: debit/credit or cash. Both options are displayed as an exclusive split. If the customer chooses to pay in cash, they proceed to the cash register to pay. Alternatively, the system is required to accept a debit/credit card and proceeds to the payment method.

The current customer experience is not optimized to enable any other payment other than debit or credit card. Unfortunately, this is not made clear at the beginning of the transaction which leads to a customer completing their order set up on the kiosk then realizing at the very end that cash payments are not accepted. Meanwhile the line in the store may have grown making the customer lose both the amount of time making the order and additionally the time it will now take to line up in the store.

It takes an average customer to use the kiosk to place and pay for the order in 5 minutes. Research done by business insider shows, during prime rush hour the kiosk line runners faster then the cashier line. An individual placed his order through the kiosk and paid at the kiosk and got his order faster than the person who stood in line at the cashier. In this instance the person standing in line came in at the same time as the person ordering through the kiosk. The kiosk customer was waiting for his food , while the customer standing in line was still waiting to place his order (Johnson, 2018).

Cash is still the most commonly used payment method in the world. “Cash demand is growing consistently, based on increasing ratio of Currency in Circulation vs. GDP and positive growth in the value of ATM withdrawals (+4.6% in 2015). The attractiveness of cash and the reason consumers often select cash as their preferred method of payment (if they have a choice in payment method in the first place), could be because cash uniquely covers many of the features that consumers most value in a payment instrument, such as 100% availability and reliability, anonymity, and direct settlement without the need for a technical infrastructure” (van der Knaap & de Vries, 2018).

Receipt Print Out

Once the customer completes their order at the kiosk, the receipt is printed, one copy is provided to the customer while another is retained by the employee. The kiosk will then return to the main menu display. Next, the employee will receive the order and must determine if the specific order is dine-in or take-out (exclusive split). If the order is dine-in, the employee must deliver the order (based on the table number). If the order is take-out, the employee must announce the order number specific to the customer for them to come pick up at the counter.

When an order is placed successfully at the kiosk or the counter, the method of verification is currently the order number which is displayed on the screen. This can get confusing for customers and can lead to miscommunication and misdelivery of customer orders. Additionally, the pick up for Kiosk orders, mobile orders, and in person orders are all in the same area. This combined with the kiosks usually placed in the middle of the store near the cashier line makes the orientation very difficult to follow.

Customers receiving wrong orders due to inaccurate order confirmation can result in many altercations between customers and employees. In a study conducted by FSR magazine, it revealed that 64% of verbal incidents are due to receiving the wrong order (Klein, 2019) . Directly attached to receiving a wrong order is poor service and long wait times which accounted for 82.8% and 80.2% respectively of verbal altercations and dissatisfaction from customers (Klein, 2019). Resulting in millions of lost potential customers due to inaccurate ordering receipts and improper order confirmations.

Excessive Queue Times

Once the customer arrives at the counter to pay in cash, the employee verifies the order with the customer, accepts the payment, and the system verifies the payment. If the customer is not able to pay the correct amount in cash, the employee returns the cash, and requests an alternative payment (exclusive split). If an alternative payment is not available, the employee cancels the order. If an alternative payment is available, the system requires the customer to pay debit/credit. Now, a payment method is required.

There is an intermediate error event when the customer’s payment is not acceptable due to the customer not being able to pay with debit or credit card. Once the customer reaches the checkout stage of the order process the customers have to either start over or get in the cashier line. In this case the kiosk (system), would need to verify the customer’s payment before the customer begins choosing their order. This is similar to paying at a gas station pump, before the customer pumps gas into their car, the system asks the customer to validate their payment method. Currently, the kiosk only accepts card payments, which forces customers paying with cash to physically stand in line to make their order.

Although it has been proven that millennials carry less cash in their pocket, a part of the population still pays with physical currency. In 2017, Dollarama introduced a self-checkout to combat increases in minimum wage. This was common among many retailers, but unlike others, Dollarama's system accepted cash payments at the self checkout. If McDonald's introduced cash payments at the kiosks, it would limit the amount of physical lineups and the system would be more organized with less human interaction (Littman, 2019).

Through field research and supporting evidence, it was determined that dine-in table tags can delay and obstruct the order process since customers are required to obtain the table tags, communicate which table tag they have selected. After the order is processed the waiter must then locate the customer. This is problematic, especially during peak times since there is low visibility and some customers might not place the table tag in a clear location.

The order process can also be heavily delayed if there are no tags available and the customer must line up for a tag. This defeats the purpose of the kiosk because the customer is forced to line up twice. Once customers receive the tag, they must proceed back to the kiosk to complete the order. As McDonald's has recently abandoned its cafeteria look and adopted a modern and vibrant scene, with some restaurants including multiple levels, the tags make it difficult to serve customers to their tables.

Downtimes / Manual Database Update

System downtimes play an important role when it comes to loss of potential sales, brand image, and employee productivity. These downtimes are caused by routine updates, connectivity issues, outages or other misconfigurations resulting in limited/no access at all. 72 percent of retailers indicated in a survey that sales were lost during network downtime and the study shows these downtimes severely impacted customer loyalty and overall business operations (*" A. Gilberto - PDF: "The Cost Of Downtime: Beyond The Bottom Line" 2018).* If a customer is in the process of selecting options for an order and a kiosk crashes due to downtime, rebooting the kiosk on average can take anywhere from 2-5 minutes and 87% of retailers have reported that it can take up to four hours for support to come when a network outage occurs. (*A. Gilberto - PDF: "The Cost Of Downtime: Beyond The Bottom Line" 2018)* Downtime can also be expected and scheduled due to reasons such as planned maintenance, unintended interruption of service, server overload or other software issues. If one critical component is inoperable then all other components of the system also experience downtime by dependency. (*R. Galloway - KioskMarketplace.com: "The High Cost Of System Downtime" 2015)* Hardware problems and device failure are also to be expected in any machine due to components that break or wear-out. A kid spilling orange juice on a kiosk while playing near it can be a random incident that damages the sensors on a kiosk which may cause the screen to stop responding to touch on

certain parts of the screen. These expensive repairs come with extensive downtime due to waiting for new parts to come in and scheduling service calls which can be very disruptive to the business.

At the end of each shift managers are required to manually input the updated inventory and proceed to inform the upcoming shift manager of any discrepancies. Through our field research and questionnaire answered by a McDonalds crew manager, we were informed that it can take anywhere from 15-20 minutes to tally up and do a final count on inventory used at the end of each shift. This time can be utilized elsewhere in the restaurant including the front-desk or the drive-thru if there's an automatic process for inventory management rather than a manual one in order to reduce problems like long customer wait-times.

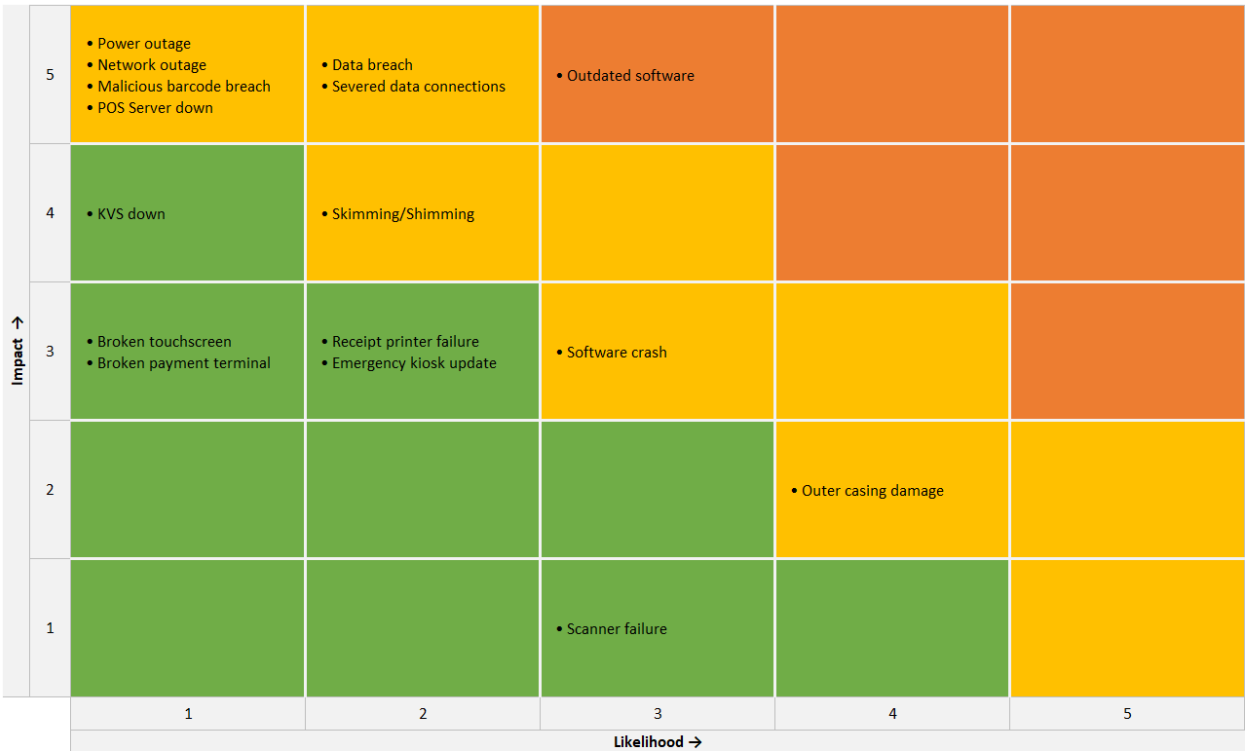
DESCRIPTION AND ASSESSMENT OF SUPPORTING INFORMATION TECHNOLOGIES

The customer-facing technology in our process of focus, which is the kiosk order process, is the kiosk itself, the attached electronic funds transfer to the point of sale (EFTPOS) terminal. The hardware of the kiosk is made up of the outer casing, an embedded pc, a infrared touchscreen, a laser printer, a barcode scanner, and the attached payment terminal. The kiosk interface is called NewPOS and is run on the operating system of Windows POS Ready 7 (“*R/Mclounge - questions about kiosk,”* 2021).

According to a McDonalds employee, the embedded PC is similar to the cash register devices with approximate specifications of 2-4 GB of random access memory, a mechanical disk drive, and an Intel Celeron processor (“*R/Mclounge - questions about kiosk,”* 2021). The kiosk is connected to an inventory database while it displays available items to the customer. It is also connected to a promotions database in order to display the active promotions that are being offered at the location. When customers place an order using the kiosk, the order is sent to a POS server which is a PC located in the back office. Once the order is on the POS server it is capable of being recalled from any register in the store. So if the customer elected to pay with cash, the cashier at the register can easily bring up the order to complete the checkout process, otherwise the customer would use the attached payment terminal with a debit or credit card to pay. The terminals can be used by wirelessly tapping or inserting the card. The terminal is connected to the payment network where the authorizations and confirmations of payment take place. After the checkout is completed the POS server then sends the order information to the KVS (kitchen video system) screens where the food assemblers can start to make the order.

For networking, since 2016 McDonalds started to use Amazon Web Services to help build their secure digital platform and since then they have scaled its digital capabilities through Kiosks, Digital Menu Boards, Mobile Order and Pay, and Delivery ("*Solutions,"* 2016). According to a systems analyst at McDonalds, the databases connected to the kiosk are built upon C++ in the front end and SQL in the backend. After every order inventory is updated. Each restaurant uses a bespoke ordering system to review previous orders and select the products they'll need in their next delivery. Along with this, McDonald's uses forecasting tools to ensure the delivery of products from suppliers to restaurants (*FAQS: McDonald's UK,* n.d.).

Using the risks identified in **Figure 8** of the appendix, a risk heat map was created based on the supporting technologies involved in the kiosk order process:



Potential Security Risks

According to UpGuard, which is a third party risk and attack surface management platform, McDonald's security rating is a 694/950 ("*McDonald's security report,"* 2021). Compared to other companies in the hospitality industry this is very low, as Starbucks, Dunkin' Donuts, and Bojangles' all have scores above 800. According to a survey commissioned by SIFT:

- 62% were concerned QSR digital interactions would lead to fraud.
- 49% were most concerned about theft of credit card data.
- 41% were worried about account takeover.
- More than one-third said an incident of fraud during a QSR transaction would end their patronage of that brand.

- 49% would hold the QSR or delivery service responsible for any security incident

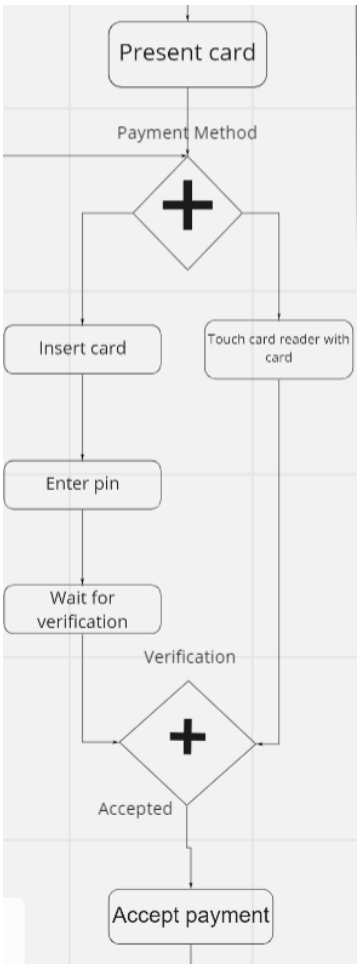
This is an indication that McDonald's can and should improve as consumers are increasingly becoming more concerned about security (“*Survey: QSR CUSTOMERS,”* 2019).
One security problem is the scanners on the kiosk used to input coupons during the order process as shown in the figure below:

Inside McDonald’s Kiosk is a POS terminal and a barcode scanner. Barcode scanners connect via USB ports and act as a keyboard. “With just 50 keystrokes, a hacker could potentially unlock the door to your operating system,” (CEO & Follow, 2018). The scanner supports command characters in their programming modes. Through use of Advanced Data Formatting (ADF) modes, hackers can send Windows-Key-r, and then *cmd.exe*, ftp a file down, and run it. Whatever computer is on the other side of the scanner has just been owned. This method has been shown to effectively launch SQL injection, cross site scripting, and overflow attacks (virustracker, 2016). The consequences of a barcode security breach include disabling of system firewalls, data corruption, ransomware and malware. Furthermore, damage to the reputation of McDonalds would be devastating and consumers would be less likely to bring their business to the company. The recovery process would entail patching security holes, rebuilding operating systems, and updating/securing databases. The internal cost to recovering critical business function would be immeasurable (Moore & Roos, 2018).

Other security concerns stem from the unattended payment terminals during the checkout process as shown in the figure on the right:

One weakness lies in devices made by Verifone and Ingenico which are two of the most widely used brands when it comes to payment terminals and many McDonald's franchises employ devices made by these two companies. “The first issue was that they used default passwords that let anyone with physical access through to a ‘service menu.’ These menus contained functions that could be abused to write malware onto the terminals. The malware could then hoover up credit card numbers once the device was in use again. Though the terminals did encrypt credit card data, they did so on the same internal system already controlled by the malware, rendering it useless. An attacker would have all the information they required to clone cards and start stealing people’s money”(Brewster, 2020). The attack would only take 5 to 10 minutes to complete and due to the fact that the kiosks are unattended this can easily be achievable.

Another issue is credit card skimming and shimming. Skimming is where criminals use a device, made to blend in transparently with the real payment machine, to steal credit/debit card information during a legitimate transaction. Shimmers work similarly but steal the data electronically from the electromagnetic chip on newer cards as opposed to the magnetic stripe used in skimming. Unattended payment terminals such as those on McDonald's kiosks are prime locations for hackers to install these machines as they can easily tamper with the payment device while pretending to be using the kiosk. These devices can also transmit wirelessly so hackers would not have to return to the site. “FICO shows there was a 70 percent increase in the number of debit cards that were compromised in 2016 at ATMs and at card readers used by merchants. FICO also reported that the number of card readers at ATMs and merchant devices that were hacked rose 30 percent.” (Giorgianni, 2018).



PROCESS REDESIGN

Kiosks have been recently implemented in the United States in 2015 with Canada following shortly after. John Betts said that “lining up to pay for the same old burger will soon be a thing

of the past."(Henderson, 2015). Unfortunately this bold statement was not very accurate as we see in the current process and from anecdotal evidence, the lines at McDonalds during peak times still exist and are yet to become a thing of the past.

Guest Assistance

The current kiosk ordering process has a standard functionality and is able to process most orders without any major problems. However, if a customer experiences issues they cannot request help from an employee and must enter the line and make their order all over again. Additionally, if their payment cannot be processed at the kiosks due to any error, once again they are required to line up and place their order at the cash register. This is a contributing factor to customer loss.

The "New Guest Assistance Process" (**Figure 12**) starts when an intermediate error occurs during the checkout process. This can be caused by a number of issues that would require an employee to assist the customer. The employee then pushes the order through and begins to process the payment manually. The employee then prints out the customers receipts and proceeds to the order assembly sub-process.

Automated Inventory Management

Kiosks currently do not have the ability to automatically update supporting technologies such as inventory scheduling. If kiosks can update the current count of certain products to the inventory database and schedule increased delivery of a particular product, this can reduce the amount of individual counting and updating supervisors must do and can redirect their attention to helping customers and their needs.

In (**figure 11)**, the new automated inventory system is utilized to automatically update based on all customer orders that are processed through the system. Once a customer orders their meal through the kiosk, the system would update the inventory and once a certain item meets its threshold, a notification will be sent to the supervisor. No action is required by the supervisor at this point as the restock efforts are automatically inputted. To avoid errors in the inventory system, managers should count inventory numbers manually 3-4 times a week.

Implementation of Table Booking System

A solution to optimizing the order process is completely removing the tags, and increasing the kiosk's role by requiring the system to request the amount of people dining in, and assigning them a table or letting them reserve tables through the application or through the in-person kiosks. This would remove the customer's impact on the process and focus more heavily on the system. Implementing a **Table booking system** within the McDonald's kiosk and mobile app similar to Cineplex's adaptation may be beneficial for McDonalds. At cineplex, movie-goers can

choose seating that best interests them in accordance to the availability. This table booking system will eliminate the use of table tags, and customers can reserve their seating at free will according to the availability of seats. Following the reservation, the customer can also preset their meals through the app ahead of time and scan their phones through the kiosk order's QR scanner. Alternatively, they simply arrive at the restaurant and order through the kiosks at the reserved tables.

The New Table Booking System as shown in **Figure 10** allows a customer to choose whether they will dine-in or takeout. If they choose dine-in the new process will show a seating map of the restaurant and customers will choose from available seating, and then continue on with the order process.

Space optimization & Mobile Kiosks

Kiosks are also currently fixed systems that are not portable, requiring customers to form a line to access Mcdonalds menu items, increasing wait times and consuming floor space. Instead, customers who choose to dine-in can have the ability to seat themselves and order from portable kiosks, the size of a tablet, fixed on every table. This means no table selection is needed, as every kiosk will self identify with their own table, reducing the ordering process and improving the utilization of floor space.

The old Customer Wait Process (**Figure 5**) will no longer exist, instead a new Customer Kiosk Access Process (**Figure 6**) will be implemented. The new process will start after the kiosks are fully booted up by the System and a customer enters the store. The customer will have the option of either seating themselves at a table, if they would like to dine-in, or order directly from the kiosks, if they would like to take-out. If the customer seats themselves, there will be a portable kiosk available to them at the table with similar functionality as the standstill kiosk however, the option for takeout will not available and activities such as "Take a table number" and "Enter table number" will be removed as the portable kiosk will be assigned to a specific table. If the customer decides to take-out they would have to wait until a kiosk becomes available and then proceed to initiate the order.

This new "Customer Kiosk Access Process" will reduce the number of loops a customer must do when checking for a kiosk and then waiting as a result of unavailability, shortening the length of the entire Kiosk Ordering Process and quickening the fast food experience customers want. This is done by dividing potential customers into two options, those that want to dine in and those who would like to take-out. Reducing the number of patrons waiting in line that would just like to be seated.

Payment Options

The payment process is also an area we will want to re-engineer, more specifically the payment option of cash at the Kiosk. Currently, if a customer decides to choose to pay by cash, then they are redirected to a McDonalds associate in order to complete the payment process. The cashier must first count and verify the payment before the order has even begun slowing down the Kiosk Ordering process. The new process would include the ability for kiosks to count, verify and process cash payment orders using existing technologies found in other kiosks such as Dollarama. This would decrease the process time and improve the quality of service provided to customers.

The "New Cash Payment Option" (**Figure 7**) would start after the cash type of payment is selected from the kiosk. The customer would insert cash into the kiosk and the system would then count the amount and then verify the legitimacy of the cash. If the cash is found not to be legitimate the payment would not be accepted and the cash returned to the customer. The system would then ask if there is an alternative method of payment, if there is the customer would be given the options of paying by debit and credit. If the customer does not have an alternative method of payment, the system would end the process and cancel the order. If the cash payment is found to be legitimate, then the system would accept the payment and proceed to the ordering process.

Security Risk

Lastly, the current process of customers scanning their coupons via barcode scanner is a security risk and expensive in terms of maintenance and installation. Barcode scanners are connected to the kiosk via USB which can be a gateway for potential hackers to attack and sift through the Kiosk OS to find private information about customers and data on Mcdonalds. Implementing a QR code system where customers can scan using the Mcdonald's app can reduce the security risk of potential hackers and increase the use of the Mcdonald's mobile app. This provides more data on individual customers' needs so that Mcdonalds can target more individualized products based on their previous order history, all the while reducing costs associated with barcode scanners.

The New Scannable QR Code as shown in (**Figure 9)** of the appendix is the replacement of the barcode scanner. When customers would like to use coupons they will have to log in to their McDonald's mobile app from their phone and use the phone camera to scan the QR code on the kiosk. The kiosk will then have access to the customers information such as their favourite orders, customizations, and any promotions/coupons that the customer has loaded on their account. This enables customers to have a more custom-tailored experience when they come to order in-store and can reduce line times if the customer is going to repeat a previous or favourite order. This will encourage customers to register with McDonald's mobile app and can increase future revenues from new mobile app customers. For customers that wish not to connect their

account when ordering from the kiosk, they can skip this step and continue with the rest of the ordering process.

Basing the redesign process on the devil's quadrangle, the four quadrants can be examined to determine which heuristic is most effective when applied to the McDonalds ordering process. The time quadrant can be reduced significantly by removing certain constraints in the Kiosk ordering process by applying the heuristic Case Based Work. This is the removal of batch based processing and periodic activities in favour of a more flexible approach to an ordering process.

Through automating various processes within the kiosks, order turnaround time would be decreased as customers would receive certain items immediately through the kiosk. Similar to Dippin Dots kiosks at many cineplexes, The machine would be able to provide cups to the customer and additionally prepare and serve ice cream and other desserts. This will reduce flexibility and batch work making the process much more time efficient. The automation of these processes will also reduce the cost of handling the activities by eliminating them. This will essentially triage certain items in any order to be readily available and served to customers immediately.

GAP ANALYSIS

Step 1 : Identify current state of the Kiosk Order Process

The current state of the Kiosk Order Process is inefficient, slow, unreliable and has major risks related to security. Currently, the Kiosk must be booted up and also completely shut down manually by an employee introducing an extra step required in the Kiosk ordering process. For example, before a customer can order they must wait until an employee enters the kiosk code and the system boots up completely. The bootup process takes 40 seconds minimum as all of the kiosks run on an embedded PC similar to the cash register devices with approximate specifications of 2-4 GB of random access memory, a mechanical disk drive, and an Intel Celeron processor (single core processor). The Kiosks also require a manual update in inventory, promotions, and items. At the end of each shift managers are required to manually input the updated inventory and proceed to inform the upcoming shift manager of any discrepancies. This is an inefficient utilization of management’s time and results in less effort put into the customers and the restaurant's success as managers become stressed and taxed after performing their inventory checklist. Any cash payments must also be redirected to the front checkout area and be processed by a McDonald's employee. Customers must first use a kiosk to place an order; however, if the payment option they select is cash, the kiosks cannot accept this form of payment and the customer must be redirected to the cashier to complete their order. This results in a two step process that is inefficient and slow, increasing the probability of customer dissatisfaction and exiting the order process.

Currently, to add a coupon or loyalty card a customer must scan a barcode on their mobile device, only then are the points or promotions added to the order. This causes two main issues, first a security risk is presented regarding the use of a barcode scanner. As discussed in the risks associated with supporting information technologies such as barcode scanners, “With just 50 keystrokes, a hacker could potentially unlock the door to your operating system” (CEO & Follow, 2018). The consequences of this breach can result in the disabling of system firewalls, data corruption, ransomware and malware leading to damage to the reputation of McDonalds would be devastating and consumers would be less likely to bring their business to the company. Secondly, scanning via barcode being the only option to add promotions and loyalty points is also denying some users that have difficulty with technology the ability to participate in McDonalds activities causing some customers the feeling of unwantedness and disclusion.

Finally, customers who would like to dine-in in one of McDonald's restaurants must first line up in the same line as customers who are ordering takeout. This causes increased lines and inefficient utilization of McDonalds floor space. After a customer selects their order, they must choose a table to complete their order. The order will not go through until a table is selected. Even if there are no tables selected, the customer must wait until a table becomes available before the order is submitted. If a customer chooses the take-out option, collection of orders including drinks and dessert must take place at the front counter. This unnecessarily increases the steps required inorder to complete an order resulting in inefficiencies and customer dissatisfaction.

Step 2: Identify the goals we have for the Kiosk Order Process (what we want to achieve)

The manual boot up and shut down of kiosks is an inconvenience for McDonalds because it particularly relies on human interaction with the kiosk. Managers and workers are already in distress due to managing inventory. In the event that the workers forget to boot up the kiosk in time for store opening, the store will face lineups at the cashiers and inconvenience customers who depend on the kiosk.

McDonald’s should try to automate the kiosks to turn on and off based on the store’s hours of operations. With regards to making the customer’s kiosk experience more convenient and effortless, they should be allowed to scan previous items and personally customized meals they have saved on their phones via the McDoanld’s app. Circle K’s convenience stores have incorporated kiosks which allow customers to indulge in beverages such as: soft drinks, milkshakes, iced creams, slushies, and more.

Currently, McDonald’s only has a soft drink station but incorporating a self dessert kiosk with a variety of features would increase the customer’s satisfaction and their overall experience. Shift

managers are held accountable for any discrepancies in inventory management since they are required to update inventory values consistently. Shift managers must request items for restocks once these items surpass a certain threshold. If these values are not inputted, it can affect the kiosk from effectively displaying available options for customers. The solution to this is for inventory management to be adjusted automatically based on orders that are processed through the system (kiosk and in-person checkout).

Automatic processing of inventory would reduce stress placed on supervisors and managers allowing them to focus on serving customers and improving other processes. The system will notify the teams if items pass a certain threshold, and will automatically send in a predetermined value request for restock. For cautious reasons, inventory should still be checked by a supervisor less frequently in the case of system errors. Errors or difficulties navigating with the kiosk can cause customers to resort to the cashier line or seek help.

It is important for customers to have an appropriate exit pathway to the cashier without inconveniencing other customers and their space. This exit should not interfere with the kiosk line or the cashier's line. The implementation of cash payments is critical towards kiosk payment being the main source of customer service at McDonalds.

Although millennials are more keen to carry less cash in their pockets, the vast majority of individuals still use cash as a consistent method of payment. "Data from more than 100 QuotePro kiosks shows that when given a choice between cash, check, credit and debit card, 70 percent of users choose cash" (Networld Media Group, 2018). Additionally, paper coupons can be a thing of the past if McDonald's implements QR code scanners into their kiosks. With these scanners customers can use their phones to save coupons, and loyalty cards. A dependable payment system gas stations have gained notoriety for using is verifying debit cards in the beginning stages of the ordering process. This eliminates time spent on the order process if the customer's payment is invalid and not verifiable by the system.

Step 3: Identify the gaps in the our current process (the issues or inhibitors of the current process)

Regarding functionality, the kiosk system exclusively takes orders and does not have the capability to prepare and serve any items on the menu. Simple tasks that are already automated in McDonalds kitchen such as the drink orders could be automated and added to the kiosks so that customers can receive their drink(s) while the rest of their order is prepared. Additionally, ice cream, hot drinks, and cold drinks could be automated into the kiosks so that the kitchen staff could prepare the food items in parallel. The installation of vending machines into the kiosk could significantly boost revenues with customer buy-in and satisfaction. The implementation "In an 18-month test, Rosenberg found the AI solution, in combination with his vending

management software, boosted revenues between 20% and 50%" (National Automatic Merchandising Association, 2019). With the correct product and software the revenues from kiosks could be substantially increased.Additionally, there is no master user that can push through orders at the kiosk in case they fail while a customer is placing an order. This can result in the customer leaving the store if they become frustrated instead of restarting their order at a new kiosk. Having a master user with a tablet that is synchronized with the kiosks and enabled by a payment processing machine would allow an employee master user to intervene when a customer order fails at the kiosk. The employee could then load their order through the tablet, complete the order with the customer and accept the payment. With an employee available to help customers and guide them through the kiosk order process, this can influence more customers to use the kiosk and eliminate the issues where an order gets lost whenever a kiosk crashes.

Step 4: Identify improvements to the current Kiosk Order Process (Improvements directly relate to each gap, cost of associated with implementation process ie delays of current processes, and identification of potential end dates of gaps)

The first improvement to the kiosk order process would tackle the issue of guest assistance and customers failing to successfully place their order. To solve this issue each store would employ one staff member who assists with kiosks incase of errors. The implementation costs would include the hourly wage of an employee while they get trained to take on this role and also the software developing costs for the new platform where the employee can manage the orders that are being run on the kiosks from a portable device. This improvement would not delay the current process substantially as the existing process can run while the employee is being trained and the software update can be pushed when the store is closed. The potential turnaround time would not be long as the employee would already be familiar with the order platform and are already trained on customer service, the extra training needed would take an estimated 1 to 2 full day shifts. However the software update would extend the gap end date by up to a couple of weeks as the new functionality is developed and tested before it becomes live.

Another improvement is to order in the new kiosks that have cash payment functionality. To order these kiosks, have them manufactured and then shipped out would take about half a month and the costs are around $1600 USD per unit excluding shipping costs (*43 inch Interactive touchscreen Display McDonald's self order Kiosk,* n.d.). There would be no delays in the current process if the replacement of the kiosks are scheduled during closed hours. The implementation costs would also include the labour costs of the technicians that will install the kiosks.

The third improvement is to implement portable kiosks at each table in the restaurant to help resolve space and lineup issues. These portable kiosks would not delay the current process as

they can be added to the kiosk ordering network without disrupting the existing kiosks. Kiosks go offline for various reasons all the time and turning one back online has no effect on the other kiosks. These portable kiosks can have the same software platform as their larger counterparts but run on third party tablets from Microsoft or ipads from Apple similar to how many other restaurants that are already doing so. The implementation costs are the costs of the devices and start at about $800 CAD per unit (*Buy ipad air,* n.d.), and also the labour costs for the technician to install the units. The potential end date of this gap would be one month for the manufacturer to ship out the item and have a technician install them at each table.

The improvement regarding the table booking system is a software update that enables the customer to see a seating map of the restaurant during his order process and choose where to be seated. The implementation costs would include permanent tags for the tables so the customer and waiter can quickly locate the table that was selected for the order. The development of the software update for the kiosk and for the kitchen video system for the staff is also an implementation cost. The potential end date for the gap would be up to a couple of weeks as the new functionality is developed and tested before it becomes live. The current process would only be delayed if the updates to the systems are done during business hours, otherwise the updates can be installed overnight when the restaurant is closed thus having no effect on the current process.

The security improvement is the addition of a scannable qr code that would be attached to the kiosks while the functionality of the existing scanners on the kiosks are disabled. There would be no delays to the current process for this improvement. The implementation costs are the costs of the stickers that the qr code is printed on, as well as the software updates to the McDonald's mobile app that would incorporate the kiosk order process should the customer choose to scan the qr code. Due to this being a more substantial functionality software update the potential end date for this gap would be close to several months as it goes through the SDLC methodology.

Lastly, for the dissociated inventory issue, a software improvement would be to connect the kiosk ordering system to the restaurant's inventory system. This would potentially have a short delay to the current process if an update is pushed during business hours or no delay to the existing process if the update is pushed when the restaurant is closed. Implementation costs include the software development costs of connecting the systems together. The potential end date of this gap would most likely be a couple of weeks as it isn't a huge task and no novel functionality is being created.

KEY PERFORMANCE INDICATORS

The Key Performance Indicators to evaluate the performance of the new Kiosk business process for McDonalds are generation of revenue, automated inventory management, and customer satisfaction (table booking, space, & speed).

Firstly for generated revenues we will focus on, order failures, and prediction of peak times. While using the Kiosk, the kiosk does a lot of upselling and studies/research shows after the implementation of the Kiosk process system revenues have increased. McDonald's wants to retain and gain new customers to do this; they can not afford to have order failures through the kiosk system. Many order failures occur due to payment or software malfunction where the customer has to stand in a long line again to process their order. As a result we implement a master user. This person will be injured on the kiosk line and when a problem occurs he/she can bypass the problem. This occurs at Dollarama Kiosk system and Walmart where there is a master user to bypass any problems customers are facing. This will in result retain customers and have many customers using the kiosk system which will generate more revenues due to the upselling and promotions of the kiosk system. One other factor for generating revenue through the new process would be the Kiosk predicting the peak times to avoid stockouts. With the kiosk predicting the peak times and when and what is chosen by the customers the fast food chain will be able to choose when to order stocks. This will avoid stockouts and will have restaurants with stocks at all times. Customers are satisfied when they receive what they come for, when it is out of stock they may not want to buy anything and Kiosk will have a hard time upselling. Having items in stock will generate revenues for the fast food chain and have satisfied customers.

The key performance indicators for the new booking system/ space optimization process is the measurement of speed of service, orders completed, and average wait times. These KPIs will indicate if the new process of removing the selection of the dine-in option from a kiosk will help reduce hot zones and bottlenecks. Instead dine-in customers can proceed to select a seating location of their choice and order from one of the mobile kiosks provided at each table, pre configured to recognize the table it is at.

Speed of service and average wait times would measure the time it takes for a customer to enter a McDonalds location, wait in line and then to actually be able to create an order through a Kiosk. Two separate measurements will be taken, one from the old process where both dine-in and take-out patrons were waiting for the same Kiosk and the second from the new process where dine-in and take-out have their own separate mobile and stationary kiosks and lines.
Orders completed would measure the amount of order submitted and the amount of orders fulfilled by McDonalds associates and Kiosks. This would include the type of order submitted,

the amount of orders dropped by the customer and the amount of orders dropped by McDonalds. These attributes would also have apporote reasoning, either being associated with wait times, product shortages, or confusion due to the Kiosk ordering process.

These KPIs would potentially help improve space optimization and allow for innovative layout designs that would no longer require take-out and dine-in patrons both forming a single line to use a kiosk. These designs will be implemented through a trial and error process where new innovations will be added such as kiosks with the ability to automatically provide drinks and desserts to customers without having to wait for a Mcdonalds associate to serve them.

IT SOLUTION SUPPORTING BUSINESS PROCESS CHANGE

SCOPE (IN/OUT)

The scope of the project is clarified by the below list which outlines which aspects of the kiosk order system will be in-scope or out-of-scope. The items in scope will be expanded on throughout this report. The end result will assess the current dynamic of the order process system with the kiosk and recommend what steps can be taken to remove redundancies in the current system and increase efficiency.

In-Scope

- Developing cash payment system which can be integrated into the existing kiosk
- Integrate guest assistance and employee “master user” status
- Developing hardware and software for automated inventory management
- Replacing barcode scanner with QR scannable code
- Implementation of table booking system along with space optimization plan
- Develop accessible kiosks to accommodate all users implementing assistive devices
- Implement customer profiles which enable recommendations based on customer data analytics

Hardware

- Developing hardware for automated inventory management.
- Replace barcode scanner with QR scannable code.
- Develop portable kiosks to be placed on each table.
- Develop accessible kiosks to accommodate all users implementing assistive devices

Software

- Developing software for automated inventory management.

- Update cash payment software which can be integrated into the existing kiosk.
- Create new internal software for employee “master user” status.
- Implement accessibility accommodations within Kiosk software.
- Develop customer profiles which enable recommendations based on customer data analytics

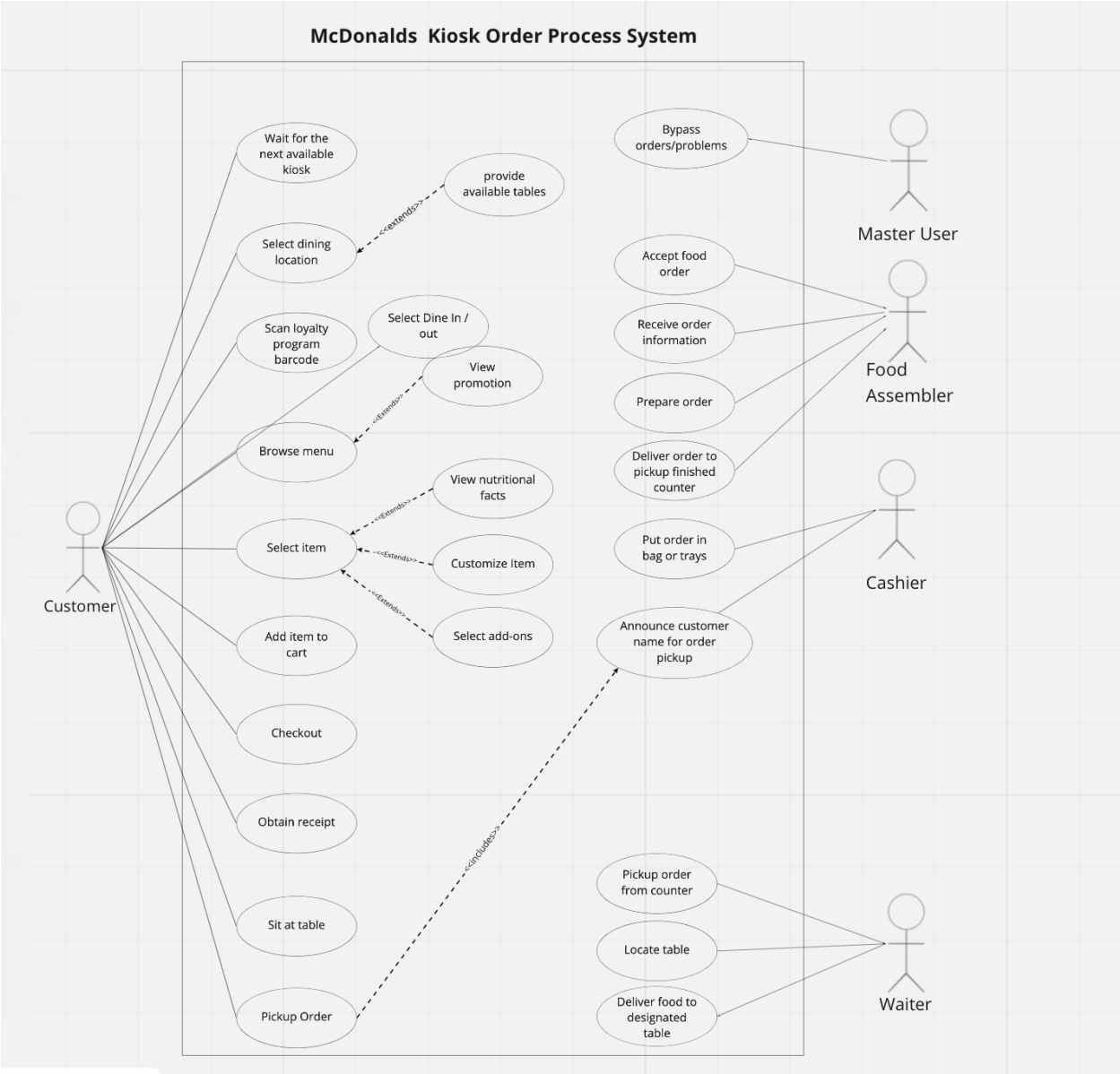
Process

- Developing cash payment system which can be integrated into the existing kiosk.
- Integrate guest assistance and employee “master user” status
- Implementation of table booking system along with space optimization plan

Out of scope

- Cashier payment
- Order Handshake
- Table tag system
- Mobile app synchronization
- Development of the subscription service
- Restaurant operating system (physical and IT)

FUNCTIONAL REQUIREMENTS



NON-FUNCTIONAL REQUIREMENTS

Hardware Requirements for Kiosk

Attribute	Minimum Requirements
Processor	● Intel Core i5 or above
Operating System	● 64 bit OS ● Microsoft 10
Browser	● N/A
Device Memory	● Higher than 8GB
Internet	● LAN Connection ● Wireless connection will be supported

Performance Requirements

Regular patches and application updates should be completed in a timeless manner, preferably outside the hours of operations of the McDonald's. Operating system updates should be administered by the IT professional to ensure there is no data loss during the update process[1].

Security Requirements for Kiosk

All kiosks must be physically secured, as well as the physical components connected (receipt printer, cash dispenser, ATM machine). In terms of data security, all methods of payments collected by the kiosk must follow PCI (payment card industry) compliance standards and requirements[2].

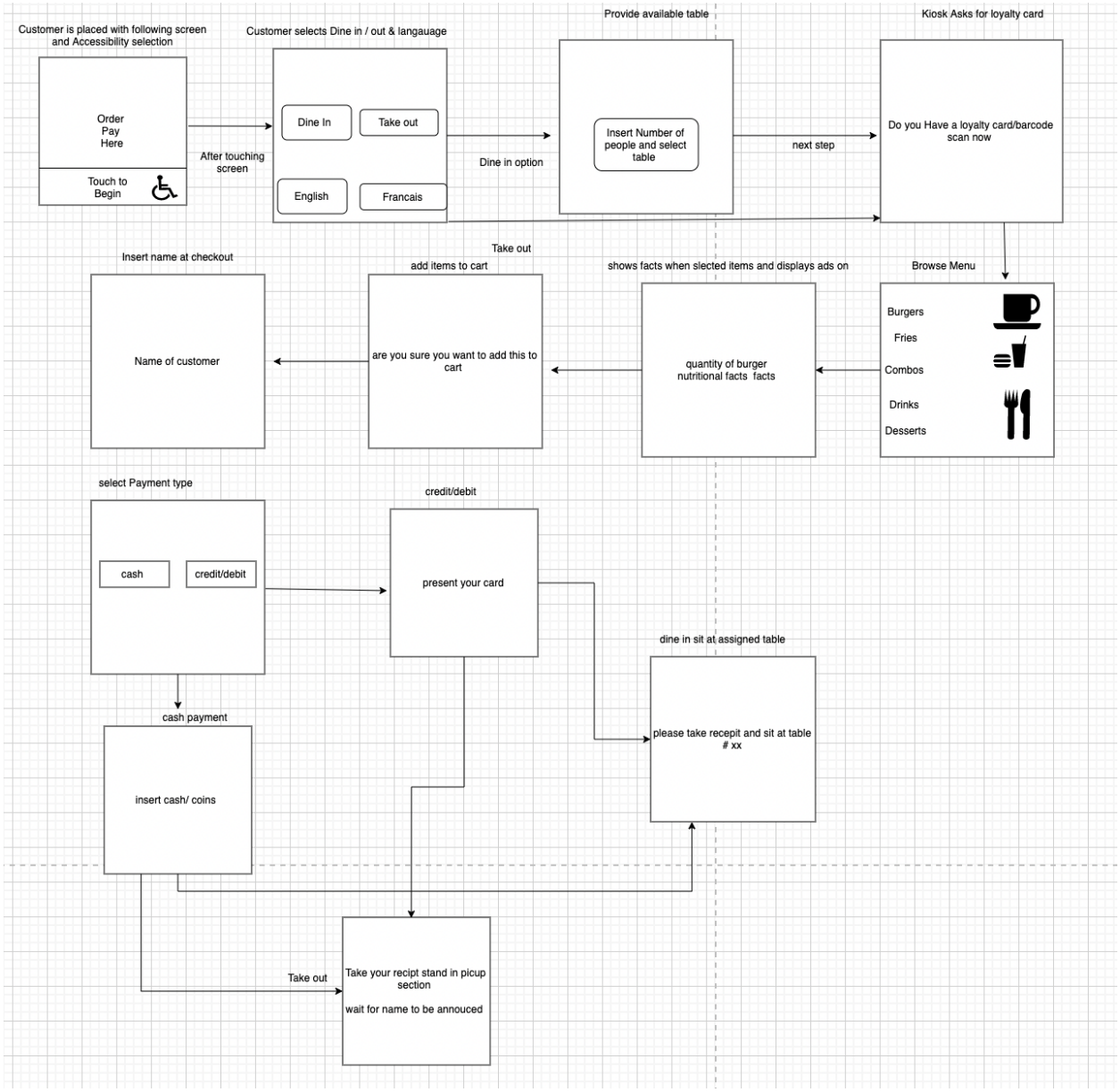
Usability Requirements for Kiosk

Kiosk navigation will be simple and easy to navigate through without assistance (see screen overview prototype). Users will be able to order takeout or dine in with ease and efficiency with the kiosks' bold lettering to help those with limited vision, visual cues, arrows and printed receipts. Text to speech technology will also be available for those with limited vision and will help to navigate them through the process without avoiding any information. For individuals who use wheelchairs, or have limited mobility they will be given appropriate space to operate and interact with the kiosk because the kiosk display will be visible from 40 inches above the floor[3].

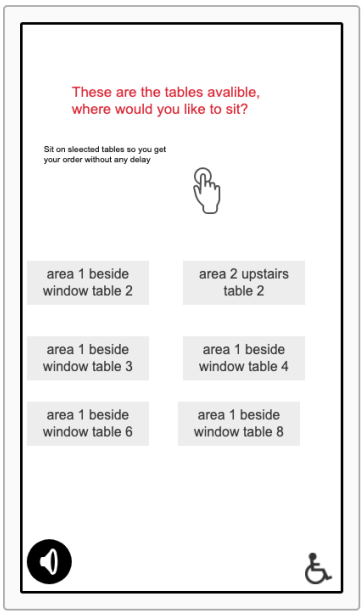
[1] https://www.utrgv.edu/is/_files/documents/kiosk-security-standard.pdf
[2] https://www.zebra.com/content/dam/zebra/white-papers/en-us/kiosk-req-en-us.pdf
[3] Montgomery, R. (2021, April 20). Creating a Usable Kiosk Experience for Customers with Disabilities. TPGi. https://www.tpgi.com/creating-a-usable-kiosk-experience-for-customers-with-disabilities/.

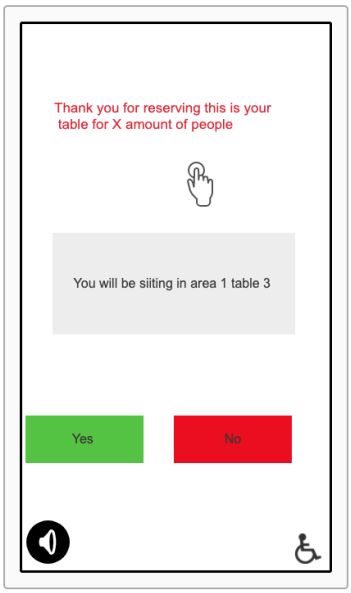
PRODUCT PROTOTYPE

1st prototype: screen overview

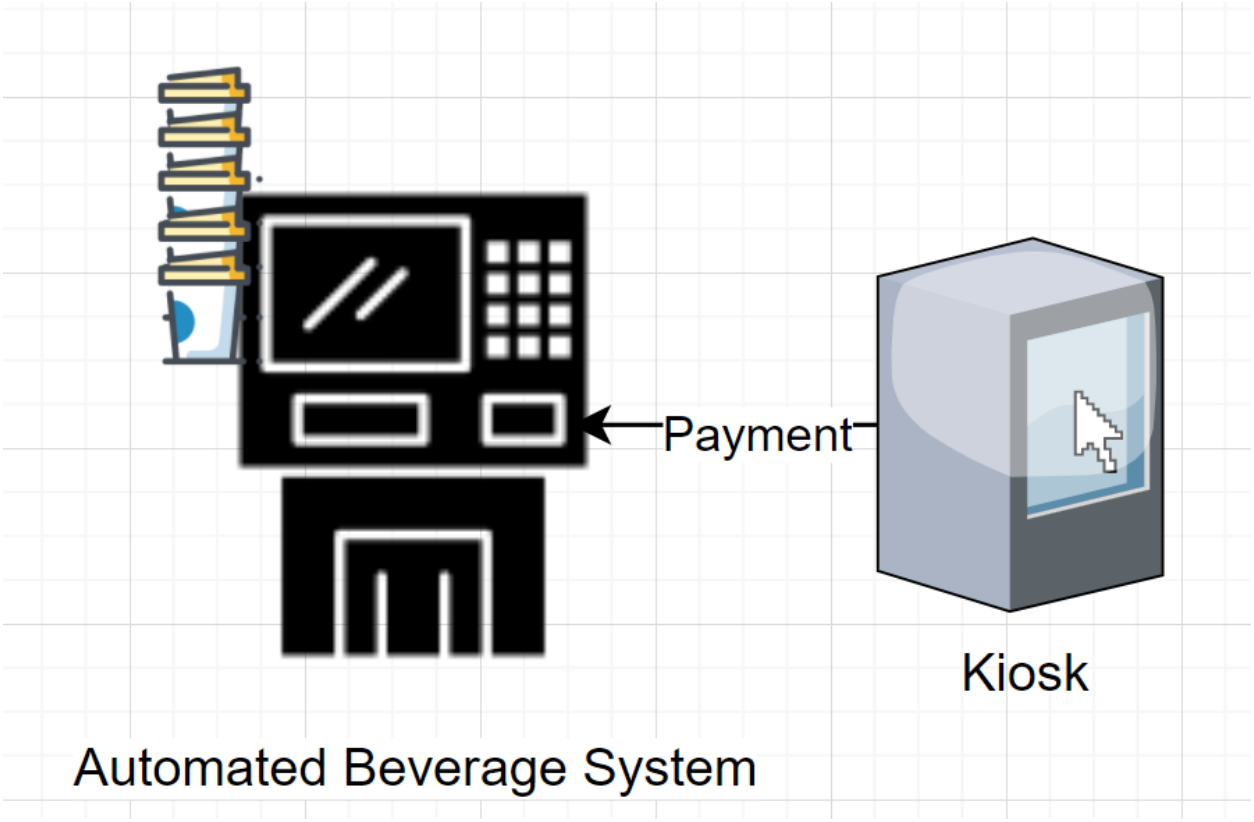


2nd prototype: table reservation





3rd prototype: Dispenser



Since the dispensers will be customer facing, they will need to be on standby until they receive a signal from the POS system. When a customer completes their order and their payment has been processed. The POS system will send a signal to the ABS with the specifications of the becareves it needs to dispense. Upon receiving the signal the machine will assemble and release the beverage to the customer.

4th prototype: Automated Inventory Update to save manager time at the end of shift so they don't have to manually do inventory count. Smart Shelves from Mettler Toledo.

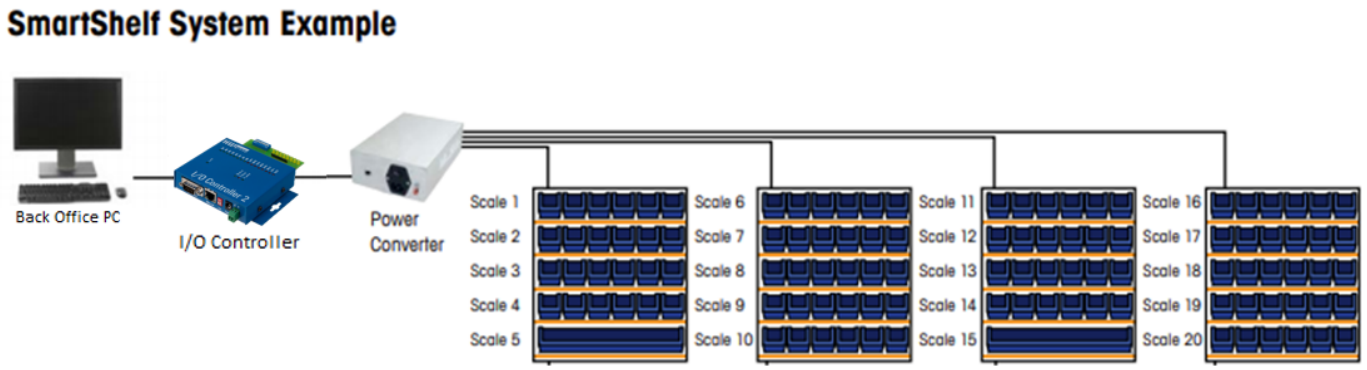
Option of purchasing complete shelves or just the weighing pads that can be retrofitted onto existing shelf systems.

Complete Shelve Options:

Pads/Capacity	**Resolution in kg**	**Shelf Size**
6 Pads, 8 kg	8 kg x 0.002 kg	1000 x 400 mm
4 Pads, 20 kg	20 kg x 0.01 kg	1000 x 400 mm
1 Pad, 100 kg	100 kg x 0.05 kg	1000 x 400 mm
1 Bench, 600 kg	600 kg x 0.5 kg	820 x 620 mm
1 Floor, 1000 kg	1000 kg x 0.5 kg	1200 x 800 mm

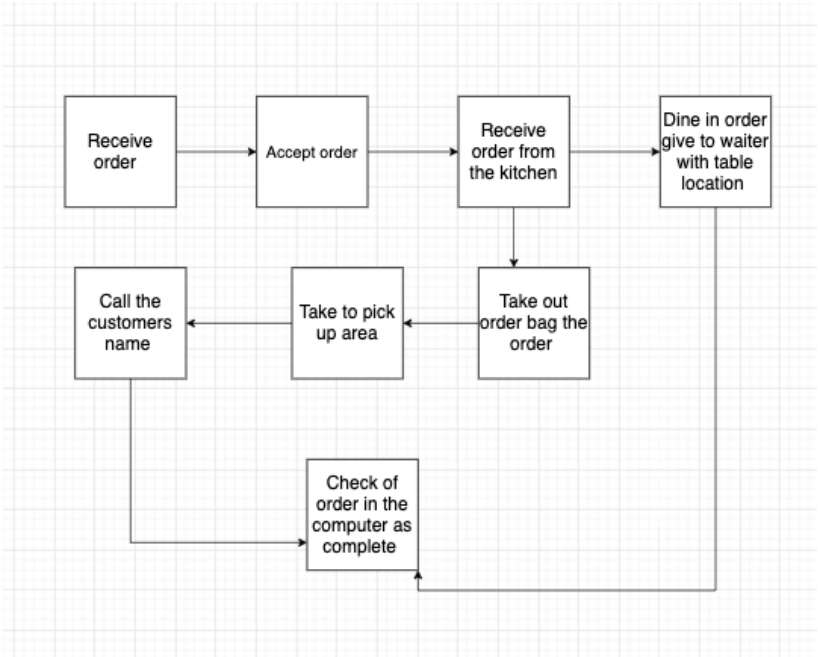
Weight Pad Options:

Pad Capacity	**Resolution in kg**	**Size**
2 kg	2 kg x 0.001 kg	Identical Size
8 kg	8 kg x 0.002 kg	
20 kg	20 kg x 0.01 kg	

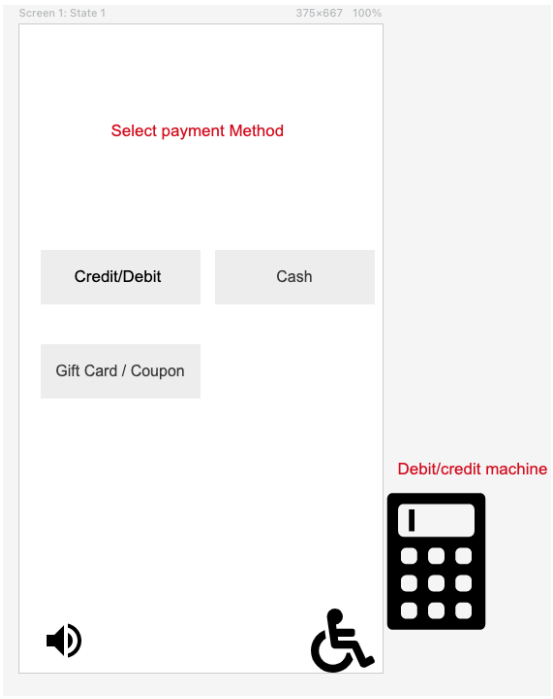


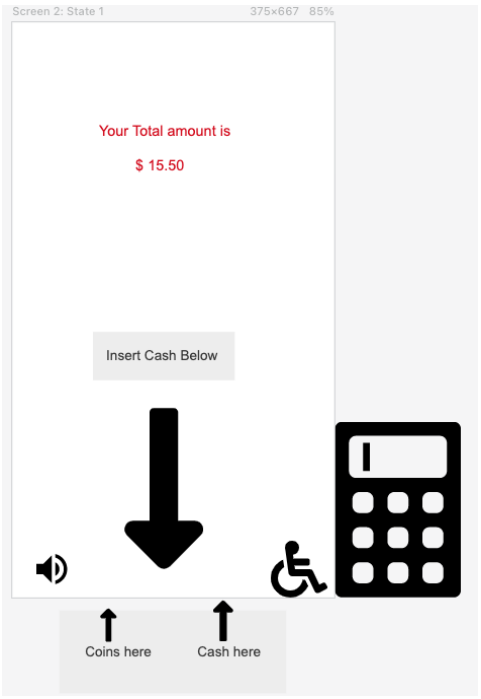
Remote Access: Weighing sensors can be digitally integrated into SmartShelf pads. This digital communication allows you to check the weight of any bin anywhere with an internet connection.
Scalability: Repeaters can be used to add an additional 20 scales if needed.
Optimization: Analyze usage trends for easy supply-chain optimization. Greater control of stock so you never run out of supplies.
Accountability: Monitor high value item usage.
Support: Global on-site support and technical assistance any time to limit downtime.

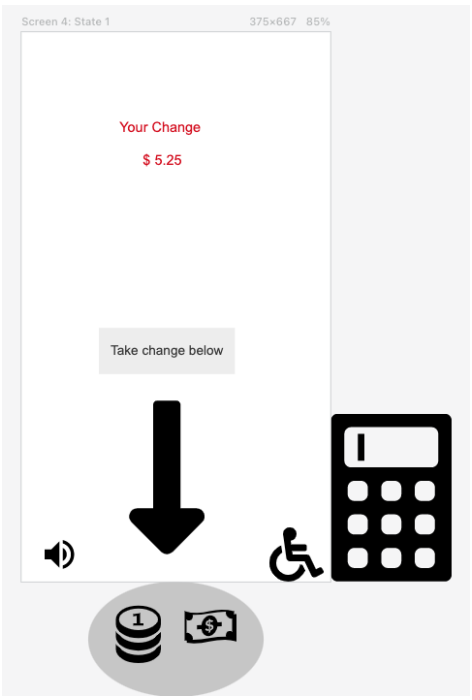
5th prototype: backend pictures of prototype with number calling

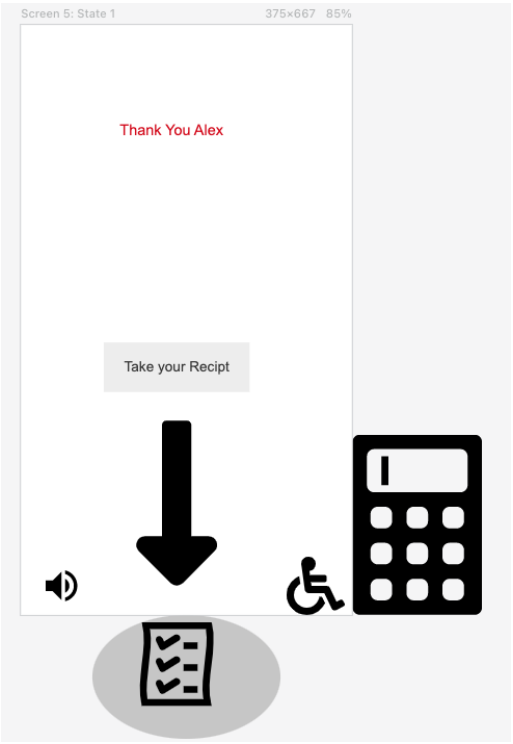


6th prototype: Cash payment at Kiosk

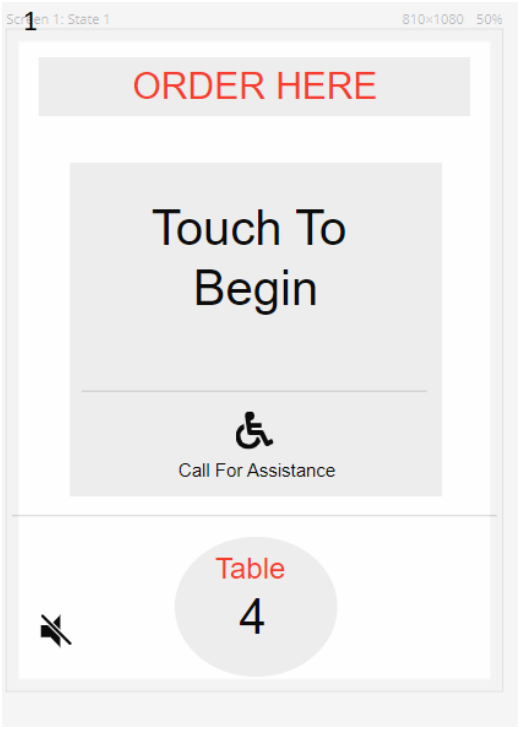


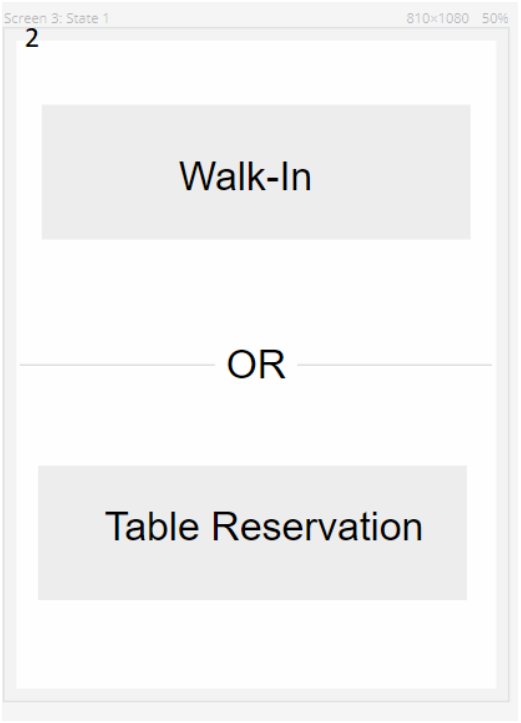


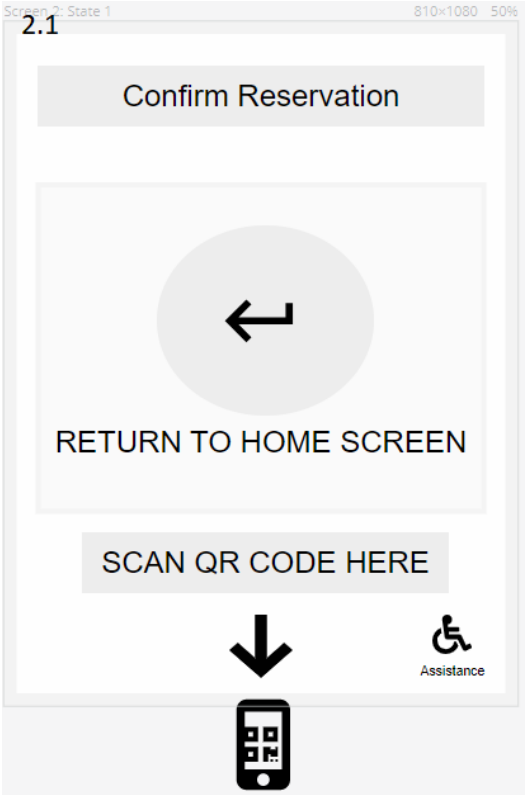


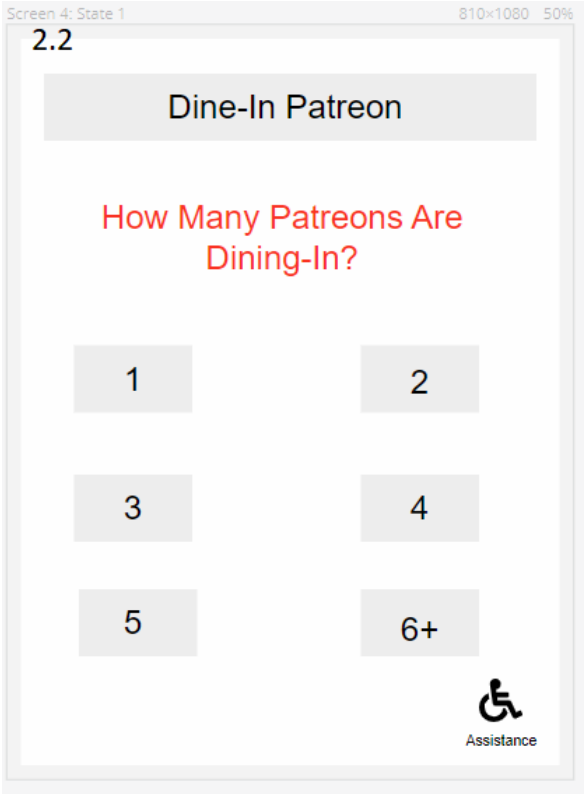


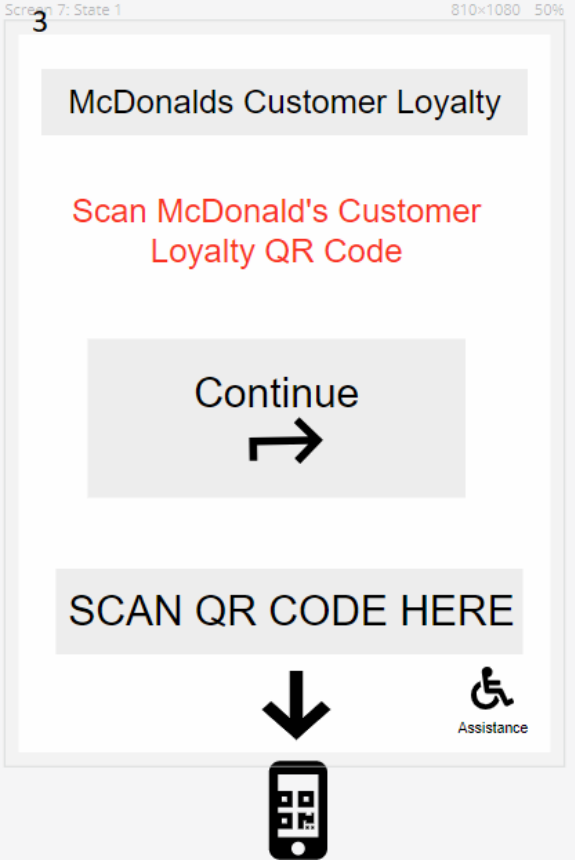
7th prototype: Portable Kiosk at Tables

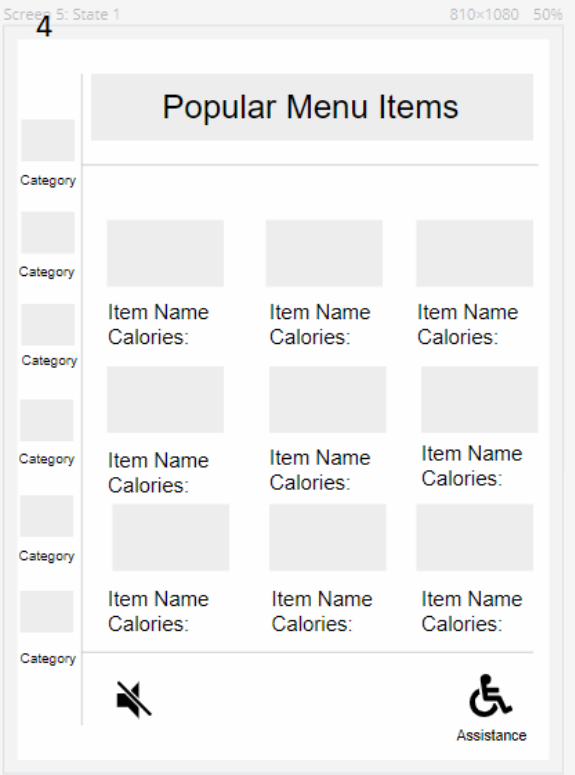


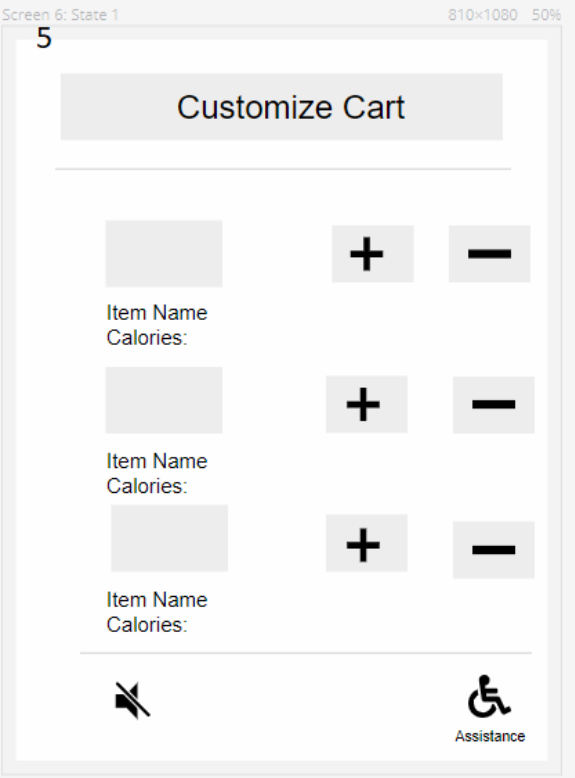


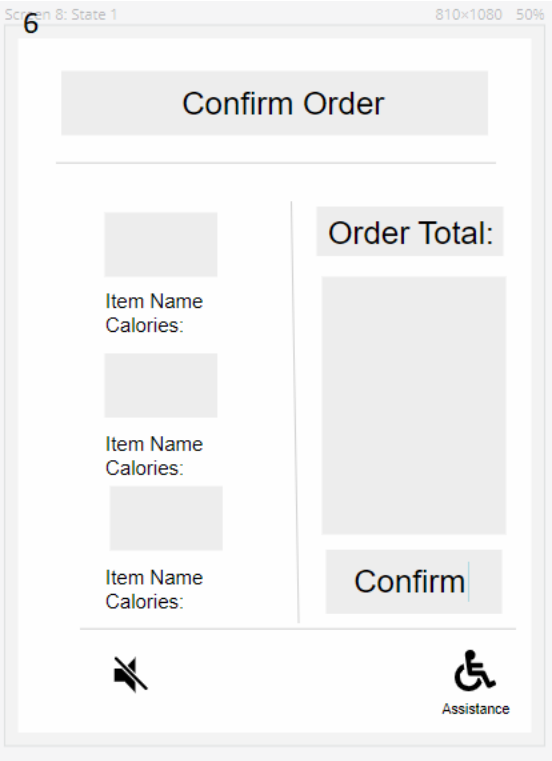





3
McDonalds Customer Loyalty
Scan McDonald's Customer Loyalty QR Code
Continue
SCAN QR CODE HERE
Assistance


4
Popular Menu Items
Category
Category
Category
Category
Category
Item Name
Calories:
Assistance


5
Customize Cart
Item Name
Calories:
Assistance


6
Confirm Order
Item Name
Calories:
Order Total:
Confirm
Assistance

COST BENEFIT ANALYSIS

1. Establish a framework to outline the parameters of the analysis
2. Identify costs and benefits so they can be categorized by type, and intent
3. Calculate costs and benefits across the assumed life of a project or initiative
4. Compare cost and benefits using aggregate information
5. Analyze results and make an informed, final recommendation

Description	Direct	Indirect	Tangible	Intangible		Total Costs
Cost Categories						
Portable Tablet Kiosks						
Physical Tablets (x4)	$6,000.00					
Tablet Software	$20,000.00					
Software Licensing Fees	$2,000.00					
Upgrade/Add ons	$10,000.00					
Installation @1400 per kiosk	$5,600.00					
Initial Project Managment	$300.00					
Overhead @2.50/hr per year		$87,600.00				
Technology Support (Guest Experience)						
Portable QR Scanner	$300.00					
Payment Terminal	$1,500.00					
Hourly wage @14.50/hr per year	$127,020.00					
Software and POS system	$20,000.00					
ABS Dispensers						
Cornelius ABS Dispenser	$10,000.00					
Installation	$1,400.00					
Automated Inventory System						
Licensing system (Netsuite) @$999 per month	$11,988.00					
System Design and Implementaion	$954,000.00					
Support and Maintenance Overhead		$312,480.00				
Total Cost	**$1,170,108.00**	**$400,080.00**				**$1,570,188.00**
Benefit Categories						
Portable Tablet Kiosks						
Kiosk Generated Revenue	$218,000,000					
Less Time in Line at Kiosks				54% of millennials say self-ordering kiosks improve the restaurant experience		
Total Order Time				Reduced total order time by nearly 40%.		
Labour Cost Saving	$43,800					
Automated Inventory System						
Decrease Inventory Waste	$108,900					
Increases Inventory Accuracy				63% inventory accuracy.		
Workflow Efficiency				30% increased workflow efficiency.		
Increased customer retention and loyalty				11% increase in customer loyalty.		
Dispensers						
Repair Savings	$22,000					
Capacity Sales	$26,000					
Increased Profitability	$22,000					
Labour Relocation (43,800 hours)	$552,000					
Increased Capactiy				Over 50%		
Increased Beverage Throughput				Over 20%		
Total Benefit	**$218,752,700.00**					**$218,643,800**

COST

- **Payroll**
  - **Employees supporting the franchise and approximately 30% of time towards supporting the kiosks**
  - **4 portable kiosk at tables**
  - **Direct Cost:**
    - A tablet-sized, portable kiosk starts at just under $200 and runs up to around $1,500 (Your Guide to Installing Self-Service Kiosks, 2021)
    - Customized software has even broader variations in cost, with so many options. Expect to pay between $3,000 and $20,000 for the software, plus licensing fees for each unit between $300 and $500. (*Your Guide to Installing Self-Service Kiosks*, 2021)
    - upgrades to the touch screen run you between $2,000 and $10,000. (Your Guide to Installing Self-Service Kiosks, 2021)
    - Installation costs: $1,400 per kiosk (*The Digital Signage Insider* 2004)
    - Initial Project management: $300 (*The Digital Signage Insider* 2004)
  - **Indirect Cost:**
    - The kiosk costs $2.50 an hour per day to run. (Sharma, 2017)

  - **Technology Support (guest experience)**
    - **Direct Cost:**
      - Portable QR scanner - 300
      - Payment Terminal - 1500
      - Hourly wage - $14.50 hour (Per guest experience employee based on current minimum wages)
    - **Indirect Costs**
      - Software and POS system
      - - 3000 - 20000
  - **ABS Dispensers**
    - **Direct cost**
    - $10,000 For the cornelius ABS (2014)
    - Installation:
  - **Automated Inventory System**
    - **Direct Cost**:
      - **Licensing system:**
        - (Netsuite) base license costs $999 per month (Craig, 2021)
      - **Building system:**
        - 954k to develop DBMS with SQL capability (*Raima* 2020)
        - Average Hourly Total Cost of a Software Engineer ($90/hr)

- Average Hourly Total Cost of a Support Engineer ($45)
- Anticipated Life Expectancy of the Application (5 years)

- **Indirect Cost:**
  - **Overhead**
    - 312.48k avg/year for support and maintenance (*Raima* 2020)

BENEFIT

- **<u>4 portable kiosk at tables</u>**
  - **Direct Benefits**:
    - **Increased Kiosk sales**
      - Self-service kiosks will generate annual revenues of $218 million in 2016 (PYMNTS.com, 2018)
      - The increase in consumer spending when ordering through self-service kiosks is 30 percent. For example, orders through the kiosk had an average check size of $17.17, while orders at the counter had an average check size of $9.79. (PYMNTS.com, 2018)
    - **Portable Kiosks are cheaper**
      - Cheaper to maintain then employee wages $15/hr to 2.5/hr (Comartin , 2020)
    - Less Labour Costs
      - According to the Bureau of Labor and Statistics, those self-service kiosks will soon be replacing a large share of the human workforce. Their figures estimate that about 80,000 fast food jobs will disappear by 2024. TheStreet cites that "half of U.S. McDonald's will have the self-serve kiosks by the end of 2018, at a cost of about $2.4 billion." (PYMNTS.com, 2018)
  - **Intangible Benefit:**
    - **Less time in line at kiosks**
      - Beyond shorter lines and improved accuracy, customers love the fact that they can save those modifications as favorites or order from their history," says Blaine Hurst, Panera Chief Transformation & Growth Officer. (Johnson, 2016)
      - Our research shows 54% of millennials say self-ordering kiosks improve the restaurant experience, while nearly half of all diners – 49% – say the same. (Johnson, 2016)
      - Data from Appetize data showed that implementing kiosks reduced total order time by nearly 40%. (Pendrill, 2021)

<u>Automated Inventory System</u>

- **Direct Benefit**:
    - **Increased inventory accuracy**
        - Shockingly, for many retail businesses, inventory is only accurate about 63% of the time. This is a pretty low number when you realize how damaging an inaccurate order can be.benefits of inventory tracking is that it reduces the amount of inventory that companies have to keep on hand while improving order accuracy. (Lowe, 2020)
    - **Decrease inventory waste**
        - cuts back on money spent housing unnecessary items. As the system identifies the proper quantities of certain products, inventory managers can rest knowing the important things are set to renew automatically. (Lowe, 2020)
- **Intangible Benefits**:
    - **Workflow efficiency**
        - Keeping inventory levels properly balanced is a daunting task that inventory managers have to deal with daily . effective inventory management can step in and prevent these dreaded events from occurring and throwing the entire supply chain off by 30%. (Lowe, 2020)
    - **Better customer retention and loyalty**
        - Automated Inventory management is meant to boost and help raise you up in the eyes of your customers by 11% .Happy customers mean good reviews and return business. (Lowe, 2020)

- **Dispensers (McDonalds-Catalog, 2008)**
    - **Direct Benefits**:
        - $60,000 A year saved through:
        - Repair savings $22000
        - Additional capacity sales $26000
        - Improved conveyor design and new thermo resistant material increases reliability, uptime, and Profitability of $22,000
        - $552,000 or 43,800 LABOR HOURS REALLOCATd
    - **Intangible Benefits**:
        - Increased ice capacity and cup staging by over 50%
        - Added cup dispensers to increase overall beverage throughput by 20%
        - New easy to read user interface improves order accuracy and consistency

IMPLEMENTATION PLAN

IMPLEMENTATION PLANNING

This is the planning phase of the implementation. In this section, outline main activities to be performed in this phase, parties to be in charge of the implementation, the structure of the implementation team(s), responsibilities of each team, timeline and cost of the entire implementation, and objectives and outcomes of the implementation.

Prototype	Main Activities	Parties in Charge	Timeline	Total Cost	Objectives/Outcomes
Dispenser	Order	Project Manager	4 Hours	$172	Examine the requirements of the franchise and any constraints. Place the order and coordinate with other parties to ensure there is a smooth installation and commissioning of the product.
	Implementation Planning	Project Manager	4 Hours	$172	Plan and coordinate the implementation across all the required parties to ensure that the installation of the ABS system runs smoothly without any major obstacles.
	Installation	McDonalds Technician	2.5 Hours	$50	Install the ABS system and ensure that the system is fully functional before handing off the manager

	Training	Manager	4 Hours	$94	Train staff on ABS troubleshooting, maintenance, best practices, and common issues.
Portable Table Tablet	Coordination and planning	Project Manager	~ 4 months	$36,000	Responsible for the coordination and planning of electrical technicians, network security specialists, and software engineer
	Develop frontend and backend of the menu interface and payment system	Software Engineers	80 hours	$4,249	Develop both the frontend and backend of the menu interface and payment system
	Physical installation of the kiosks/ Altering electrical outlet	Electrician Technicians	2 hours x 4 Kiosk (8 hours)	$360	Responsible for the physical installation of the kiosks which would involve altering outlet locations for charge ports and the assembly of kiosks
	Installation of Wi-Fi receivers and the profiles	Network Security Specialists	8 hours	$376	Responsible for the installation of Wi-Fi receivers and the profiles created for each kiosk to allow for automatic connection to the restaurants wireless internet

	Test the security measures	Network Security Specialist	8 hours	$376	Test the security measures in place between the kiosks and the restaurant's wireless network to ensure no cyber-attacks or leaks occur
	Implementation of the menu interface, payment interface and the uploading of individual kiosk profiles and settings	Network Security Specialist and Software Engineers	40 hours	$4004	Implementation of the menu interface, payment interface and the uploading of individual kiosk profiles and settings
Cash Payment Dispenser	Create a project plan, discuss potential outcomes, get the plan approved.	Project Manager		Localization. $500 integration fee (one-time fee); $234 annual fee. Retail Digital Integration. $500 integration fee (one-time fee); $365 annual fee	Not everyone has a debit/credit card in order for a better customer process at the kiosk customers will not have to wait in additional line up to pay by cash. This will create a faster and a open solutions for many customers

	Project manager receives appropriate products and implements plan with schedule of the day-to-day activities to install and have the kiosk working	Hardware technician, Electricians, Software engineers			
Automated Inventory Management	Developing cloud-based inventory management software	Software Developer team, Project managers, Security specialist	8-10 weeks	$15,000-20,000 one-time software development fee (Software development team hourly rate: $150-$190)	Implement a system where it is easy to monitor customer demand, remove obsolete stock, use data and forecasting to control purchasing procedures. Overall objective is to reduce operational costs, reduce risk in business and optimizing inventory levels. (Specifics: no manual stock count, real-time stock updates, accurate purchasing analytics, everything is automated)

	Test security measures		2weeks		
	Implementation of real-time stock levels and menu interface				
	Training		15 hours	Manager ($235-352) Employee ($150-$225)	

The main activities include ordering the Automated Beverage System (ABS) machines according to the number of kiosk terminals which will be installed at the respective franchise. It will also include planning out the physical location for which each ABS will be installed in the restaurant. This is an important step since depending on the floor plan and space optimization, the number of dispensers that can be installed may vary from store to store.

The parties in charge of the implementation of the ABS's will be a project manager. The implementation team will include members who will be responsible for different aspects of the project. This includes a representative from the manufacturer who will be responsible for the timely delivery of all machines that were ordered. The team will include the restaurant manager whose responsibilities will include providing the vendor with access to areas of the restaurant upon delivery and receiving the ABS. The parties responsible for implementing the installation of the ABS will be McDonalds technicians (2.5 hours). The installation can be contracted to 3rd party service vendors to quickly assemble the ABS or Mcdonalds technicians will need to be trained and commissioned to complete the installation of ABS systems upon their arrival to a given franchise location. Once the ABS systems are installed, the manager will need to train staff

on troubleshooting any issues that may arise. Additionally, the manager will need to train staff on how to support and redirect customers in case they are not familiar with the new process.

Upon receiving the ABS the installation time is approximately 2.5 hours for installation. Decommissioning. Also, **testing** will take place by the store staff which can take up to 2 hours[4].

Once fully installed adjacent to the kiosk, technicians will need to lock the interface on the ABS so that it only takes inputs from the POS. (What team can do this?). Once the interfaces are connected the ABS system will be operational and ready for testing.

- **Cash Dispenser**

The existing kiosks will receive a cash payment accessory which will accept tangible currency for each of the kiosks in the store. The main activities include determining how much space the kiosks would take after the cash dispensers are attached to each of the kiosks. If the cash dispensers take up too much space, it may be hard for customers and employees to navigate throughout the restaurant. The current kiosks may have to be moved throughout the store to utilize space more efficiently. Another main task is determining the estimated workload and time to attach and program the dispenser to synchronize with the kiosk, and whether it will happen during store hours, after store hours, or in multiple instances.

The implementation of the cash payment system will be executed by the project manager who will control all the day to day activities and cooperate with the external parties (electricians, software engineers, IT enterprise architects, etc) to complete the project. Upon timely delivery of the cash dispenser from the manufacturer, McDonald's will hire technicians to install the cash dispenser to the kiosk. Professional technicians will be required because there are security issues that will arise if the components are not installed properly. The average hardware technician makes $16 an hour and each kiosk will take 1.5 hours to install and attach the cash dispenser to the kiosk. Personal experience and field research revealed that the average McDonald's restaurant has at least 3 kiosks operating. Upon completion of the hardware installation, electricians will be required to install the electrical equipment, configure the dispenser to the mainframe kiosk, and finish by testing the entire system to make sure it receives an output. On average, electricians make $31 an hour and at least two electricians will be required to complete the installation for all the kiosks in a store. The installation process is likely to take 4 hours to completely install and test all kiosks. Next, software engineers will be required to design the kiosk system with the added cash dispenser, possibly develop the system to run more efficiently and further test the system functionality. With the cash now being handled by technology and not a human, more security efforts will be required when ensuring the correct change is given and identifying counterfeit money. One average a software engineer makes $34 an hour in the U.S.

[4] https://www.youtube.com/watch?v=rBbfRvtd7yo

The job of the software engineer can take more than one day because it is a long process to implement a new system within a machine while being wary of security threats and other implications.

- **Portable Table Tablet**

The main activities performed in the portable table kiosks implementation phase is the development and installation of the portable kiosks which include setting up software such as menu interface, payment interface and the uploading of individual kiosk profiles and settings. The connection of portable table kiosks with the restaurant's wireless internet connection will also need to be set to allow for automatic connection and for network permissions to be set accordingly to provide security for the restaurant's internet connection. Installing and altering electrical outlet location in order to better customize and allot for improved floor space utilization would also need to be considered and needed if necessary.

The parties responsible for the implementation of the portable table kiosk would be project managers, electrical technicians, network security specialists and software engineers. The structure of the implementation team would consist of project managers who would be responsible for the coordination and planning of electrical technicians, network security specialists, and software engineers. Software engineers would be required to develop both the frontend and backend of the menu interface and payment system. Electrician technicians would be responsible for the physical installation of the kiosks which would involve altering outlet locations for charge ports and the assembly of kiosks. The network security specialists would be responsible for the installation of wifi receivers and the profiles created for each kiosk to allow for automatic connection to the restaurants wireless internet. The network security specialist would also test the security measures in place between the kiosks and the restaurant's wireless network to ensure no cyber attacks or leaks occur. They would also be responsible, alongside software engineers, for the implementation of the menu interface, payment interface and the uploading of individual kiosk profiles and settings.

The timeline estimated for the completion of the portable table kiosk tablet is entirely dependent on the software engineers completing their development of the menu and payment interface within schedule, which typically takes around 10 days to a month to complete (https://www.reddit.com/r/web_design/comments/arezp4/how_long_does_it_take_you_to_design_and_develop_a/). The implementation of the interfaces and installation of the portable kiosks with the necessary alterations to electrical outlets and wireless network capability and security is around 6-12 months. Alterations to electrical outlet typically take around 2 hours to complete (https://www.homedepot.com/c/ah/how-to-replace-an-electrical-outlet/9ba683603be9fa5395fab908943e20a) , however proper permit acquisition and inspections may take several days which cost around $200 for an ESA inspector and permit (Srhcan et al., 2016). The cost of an electrical technician is estimated to be around $90-$180 per hour (Total cost: $360)(Jiffy, 2020). The cost

of a network security specialist is an approximate average of $47 per hour (Total cost: 376) (ZipRecruiter, 2020)The cost of a project manager is $300 a day (Total cost: $36,000) (Gerba, 2004). The cost of a full stack developer that both manages backend and frontend coding costs an average of $53.12 per hour (Total cost: $4,249) (Talent.com, 2021). Resulting in the total cost of the project including the software development cost totaling $40,985.

The objectives of the implementation of the portable table kiosk tablets is to remove the need for table tags, increasing the kiosk's role by requiring the system to request the amount of people dining in, and assigning them a table or letting them reserve tables through the application or through the in-person kiosks. This is done so that the outcome would result in increased kiosk sales, reduced overhead and increased customer satisfaction due to the removal of dine-in customers having to wait in the same line as take-out customers.

- **Automated Inventory**

The software engineering team will be responsible for developing a cloud-based inventory management software that has the ability to provide real-time stock levels, update counts of specific items as they are purchased, while simultaneously scheduling increased delivery of a particular product once the stock count goes below a certain number.

The IT management team will be responsible for installing this software on the tablets, kiosks and all other computer systems while ensuring the software is constantly up-to-date. The floor managers will be responsible for accessing the software to verify inventory cycle counts rather than inputting manual data which significantly reduces the amount of time utilized and risk of human error. The floor managers will also be responsible for training the merchandisers and chefs on how to use this system in order to ensure stock updates are monitored in real-time as orders are being completed and inventory is being used.

To ensure staff training doesn't interfere with seasons with more traffic, it is important to understand how long this new system will take to implement and when it's the right time to make such a drastic change. Data transfer is also much easier when there are fewer products compared to high-demand seasons with promotional events. Implementing a cloud-based inventory management system along with training takes on average, 12-16 weeks. (Cleartinity, 2020) (1. System testing 2. Integration Testing 3. Volume Testing 4. Employee Training)

The cost to develop an inventory management software ranges between $15,000-$30,000 depending on the variety of features and functionalities which will be selected by the project manager after a thorough analysis. (Check above reference from Arif for salary of Project

manager salary). The hourly rate for this software development team in North America is roughly $150-$190 (Trotman, 2021).

IMPLEMENTATION STRATEGY

Dispenser

Out of the four available implementation strategies we decided the most appropriate strategy for the new dispenser system was a pilot. Unlike the direct cutover a pilot strategy has lower risk because the entire organisation will not be affected. If all McDonald's locations had issues with their beverages after the direct cutover there would be huge losses in revenue and customer satisfaction would drop heavily. Instead the possible risk is limited to the location that is undergoing the pilot trial. We also decided against a phased roll out for this specific solution because the dispenser solution is too simple of a system to be split into phases. A parallel strategy was also ruled out due to the low risk of failure for this system, as parallel roll outs are a very expensive and labour intensive option due to keeping two systems operational at the same time. We also wanted to avoid customers from ignoring the new system in favour of the old one. A pilot plan also allows us to assess the performance of our prototype in live experiments and identify bugs or other opportunities for improvements before the system is extended to the whole organisation. The pilot strategy quickly delivers a version of the solution which can increase the stakeholder buy-in once they see the benefits in action.

Automated Inventory - Phased Rollout

For the Automated inventory, the implementation strategy that will be used is going to be under a phased approach. Deployment of features, tools and functions is done over a certain period of time. This is more of a measured approach and can be less risky as it enables McDonald’s to focus on “quick” wins, focusing on the functions that deliver the most immediate benefits while applying learnings from the initial deployment phases along the way to ensure subsequent phases are executed timely and accurately. This strategy may take longer compared to the other strategies but it ensures bugs and process issues are taken care of prior to tackling another phase of the project.

Implementation strategy – Cash Dispenser

With the delivery of the cash payment dispenser, McDonald’s would be one of the few retailers and fast-food chains to accept cash currency through kiosks. The other notable retailer being Dollarama. The implementation strategy best suited for this technology is parallel run because it would give McDonald’s and its customers time to ease into the change while still offering their old systems (kiosk

ATM, mobile app payment, cashier). Since the covid-19 outbreak and even before only 40% of millennials said they carry cash with them. For these millennials the cash payment may not be useful since they're prone to having their cards on their phones, or making payments through the app. However, the survey also suggested that 45% generation Xers and 59% of baby boomers carry cash with them. This shows the older the consumer is, the more likely they are to carry cash. Again, the parallel run implementation strategy is most appropriate for the cash dispenser because it invites the least amount of risk for the company. More and more people are becoming more reliant on technology and in the future carrying cash could even become a forgotten practice, but there is also the likelihood of the cash dispenser convincing people to start carrying cash. McDonald's should not follow an emergent change and implement a cash dispenser within each of their kiosks. Instead they should install the cash dispenser in only ⅓ of the kiosks in the store, and evaluate the negative and positive outcomes for a certain amount of time before converting to the new system completely.

Portable Table Tablet

The implementation strategy we will be using for the portable table tablet kiosks is the parallel method. This is when both old and new systems are used for a period of time until the new system has become normalized and the shareholders have become accustomed to the system. This would allow both the traditional method of ordering from a standalone kiosk then taking one's food to a table and the new fixed table kiosks to operate consecutively, allowing for an equitable transition period to occur so customers can understand the benefits of a fixed table kiosk. This would result in a more expensive implementation strategy as both systems need to be constantly updated and maintained; however, the long term benefits of transitioning to a table tablet styled kiosk outway the short term costs of maintaining both systems listed in the CBA.

RISK ASSESSMENT AND MITIGATION

The table below lists the risks we have identified through techniques such as brainstorming and interviewing and through secondary research. To determine the severity of each risk in the table we used a probability

		Likelihood		
		1	2	3
Impact	1	Low	Low	Medium
	2	Low	Medium	High
	3	Medium	High	High

and impact matrix like the one shown to the right. For each risk we list some mitigating actions to take and choose a strategy to tackle each risk out of the main four of Avoidance (A), Reduction (R), Transfer (T), and Retention (RN).

The overarching themes of our risks are: Technical issues, Human behaviour, Economic circumstances, Management activities and controls, Workplace politics, and Legal and Commercial relationships. These risks rise from a combination of project management processes and product processes.

ID	Risk	Description	Severity	Strategy	Mitigation
1	Inadequate user documentation	Users are unable to fully utilize new IT as it was intended owing to poor user documentation	High	R, T	● Develop clear requirements definition ● Build documentation throughout the PLC ● Assign a document writing specialist
2	Application (software) not fit for purpose	Perception among users that the software provided does not directly help them with task	Medium	R	● Develop clear requirements definition ● Perform group reviews ● Obtain progressive signoff of milestones
3	Poor production system performance	The selected software architecture/platform does not meet the purpose for which it was intended, resulting in a system being released into production which is excessively slow or has major operational problems	High	R	● Conduct comprehensive testing in near production conditions ● Conduct proof of concept testing ● Development conducted in near production conditions

4	Technical limitations of solution reached or exceeded	A technical limitation is encountered during software development resulting in time delays to the project while a work-around solution is determined	Medium	R	● Develop strong technical design
5	Incomplete requirements	Insufficient information has been obtained in the analysis phase, resulting in construction of a solution that does not meet project objectives	High	R	● Obtain clear scope specification and signoff ● Liaise with stakeholders
6	Inappropriate user interface	The software user interface selected or developed fails to meet user requirements	Medium	R	● Adopt standards for interface design ● Liaise with potential users
7	Personnel shortfalls	Inability to complete work assigned owing to insufficient staff	High	R, T	● Plan for resources ● Procure external parties ● Plan contingency options
8	Poor quality of staff	Standard of work is poor owing to lack of ability, training, motivation, and experience of staff	Medium	R. T	● Assess project staff capability ● Procure external parties

9	Changing market conditions	Business return on investment in IT can be eroded owing to changing consumer market conditions or advancements in software engineering	High	R	• Sound project planning and schedule management • Manage expectations
10	Software no longer needed	Software is developed that is prematurely terminated because its value or impact exceeds what management are prepared to absorb	Low	R, RN	• Establish sound business requirements • Manage key stakeholders
11	Harmful competitive actions	Competitors may build solutions more quickly, with greater functionality at cheaper cost, and aggressively deploy the final product within the same market space	Low	R	• Develop customer relationship • Maintain market entry barrier
12	Unreasonable project schedule and budget	The project is unable to realize its objectives owing to unrealistic restrictions placed on the projects budget, schedule, quality or level of performance	High	RN	• Make tradeoffs between cost, time and scope • Manage expectations
13	Continuous changes to requirements	Stakeholders (includes users) continuously make changes to software functionality throughout the project life cycle	High	R, T	• Enforce formal change management process • Ensure key project documentation is signed off

					● Consult/educate stakeholder in change management practice
14	Lack of agreed-to user acceptance testing and signoff criteria	The project close-out can be delayed owing to an unclear understanding of what constitutes sign-off and final solution delivery	High	R	● Consult/train the user in test design
15	Failure to review daily progress	Manager fails to review the progress of daily deliverables resulting in project slippage	Low	R, RN	● Monitor project daily, if required ● Create a consultative environment
16	Lack of single point accountability	It is typical of large software projects to have many team leaders but no single point of responsibility for deliverables, resulting in the project failing to meet its objectives	High	R	● Project manager is held accountable ● Roles and responsibilities clearly defined ● Project sponsor/owner is accountable ● Establish clear communication and escalation hierarchy
17	Poor leadership	The project manager and/ or steering committee is not committed to solving problems and providing direction to the project team	High	R, RN	● Appoint an experienced project manager ● Establish steering committee selection process and operational guidelines ● Utilize established communication and escalation hierarchy

18	Corporate culture not supportive	Corporate culture may be project adverse owing to other hidden agendas, factions within the company, organizational culture under continuous change or threat of change, and other internal priorities	Medium	R, T	● Manage stakeholders ● Apply political influence ● Obtain executive management support
19	Lack of formal change management process	Project progress is hindered owing to ad hoc changes to system specification without a formal review of technical and project impact	Medium	R	● Implement a formal change management system ● Educate users on the change management process
20	Unrealistic expectations (salesperson over sells product)	Items promised for delivery to individuals by the vendor may be over sold and unrealistic	High	R	● Screen proposals ● Develop clear requirements definition ● Manage customer expectations ● Test validity of vendor claims
21	Gold plating (over specification)	The team is focused on analyzing and generating excessive levels of detail losing sight of the project's objectives	Medium	R	● Monitor and review development to baseline design ● Strict adherence to requirements definition
22	Inadequate third-party performance.	The contractor is unable to provide a solution that meets time, cost, quality and	High	R	● Screen contractors upfront ● Monitor contractor performance

		performance objectives			● Retain right to remove unfit contractor
23	Litigation in protecting intellectual property	Inadequate protection of software at the start of the project results in competitors taking advantage through copying, resulting in high litigation cost, and loss of market potential	Medium	R, T	● Consultative engagement ● Contract conditions
24	Friction between clients and contractors.	A result of misunderstandings, unanticipated changes in the scope of the contract, missed or delayed delivery, or some other item of dispute that polarizes clients and contractors into opposing camps	Medium	R, RN	● Consider personal attributes ● Monitor contractor performance ● Manage the relationship

Most of the treatment strategy is risk reduction while some of it was risk transfer when outsourcing options were possible. The avoidance strategy was avoided as we believe these risks arise from essential activities that we cannot eliminate to complete the project. The mitigating actions are mainly through project management processes which indicate the high importance the IT project manager role plays. The most concerning areas of project management that are related to the majority of the high severity risks are scope & quality management, stakeholder management and human resource management. Managing these areas can help reduce the technologically related risks that can stem from these areas, for example the risk of incomplete requirements stemming from the risk of stakeholders continuous changes to the requirements. The key to managing most of these risks are excellent project management and that very few IT risks are actually technical risks.

To monitor these risks, this register should be reviewed iteratively in order to identify new risks, keep updated on each of these risks in order to reclassify them if necessary. A risk owner should be assigned to each of them to have a dedicated person responsible for auditing the risk and keeping a close eye on it in between the iterative reviews. Some risks can be quantifiably

measured and should have a metric associated that is conveyed to the risk owner. Risks will vary in how volatile they are in reaching the risk realization point so risk owners should change the frequency of updates accordingly.

TESTING

Dispenser

The testing strategy for the ABS is very straightforward and does not require any additional costs as long as McDonalds staff and technicians undergo in-depth training using the tutorials provided by the manufacturer. Once staff have successfully completed the training material they can initiate testing the different components of the ABS. Firstly, the interface, beverage selections, and flow of the machine will be tested. This will include ensuring that the machine dispenses the beverages which are selected accordingly on the tough pad. Once the machine is deemed to be functioning to standard, staff will be required to test more specifics of the machine so that no defects are discovered during live service. The pour time will require a few tests to ensure that the average time it takes for the dispenser to pour the beverages is within the prescribed time frame. This will enable staff to adjust any pressure valves in the dispenser if any issues are discovered. Additionally, the ice dispense time, top off delay and top off percentage will need to be tested and adjusted accordingly. The specific weight of ice will need to be tested and adjusted so that an acceptable amount is dispensed with each beverage. Once the calibrations have been completed the updated specification will need to be saved on the system otherwise the ABS will return to the default settings. The total flow for the water, carbonation, and syrup will also need to be adjusted. A measuring cup can be used to measure how much liquid is dispensed to ensure that when the cup sizes are selected, the respective amount of liquid is dispensed. These settings can be calibrated as needed to reach the desired volume for the portions that each cup size requires. Once the beverage settings have been set, the staff will need to test the cup dispenser turret and the rotational belt that sends the filled cup out to the customer. The last step of testing for the ABS will be ensuring that the dispenser only releases beverages once it receives a signal from the kiosk system after the payment has been processed. Staff will need to test this with all payment options and ensure that the dispenser is providing beverages once payments have been successfully processed. The testing of the ABS and the POS system will ensure that any oversights are discovered before live service. This will allow some time for staff to troubleshoot and remedy any issues which are brought to light during testing. Additionally, any parts that are not functioning properly will need to be addressed upon installation or as soon as they are discovered to remain within the manufacturer's warranty.

Portable Table Tablet

The testing strategy for the portable table kiosk tablets will be both extensive and all around inclusive, ensuring that operation of the portable table kiosk is seamless. The testing strategy will commence in an agile approach with multiple aspects of the table kiosks, including the perpihplels and software associated with the kiosk, running side by side. This is to increase effectiveness of the testing and increase efficiency in testing multiple components at once, if no conflict of operations occurs.

The first testing plan will be to ensure that all screens are operational and are well integrated for the software created. This is so that interactions within the menu system and ordering system can be registered and no features have been overlooked in the implementation process. This is also a chance to catch any glitches or conflicts in the software as first real world testing of both the ordering and payment process will commence at this stage. Resource requirements for this plan would include adequate computational power for the kiosk including sufficient RAM and storage amounts. These would require individuals such as software engineers with extensive knowledge of both computer hardware and software to tackle issues relating to the internal operations of the kiosk. The defect resolution process for the software integration testing would be to delay the launch of the table kiosks if major software issues have been found to reduce the effectiveness of the portable kiosk tablet project. However, if minor faults have been found in the software that do not hinder the effectiveness of the kiosks then, the kiosks would remain operational until an over the air update has been created to solve any issues discovered. This is possible because of the parallel method of integration used.

The second testing plan will be to ensure that the capabilities meet standard operational requirements by testing throughput and load bearing capacity. This will be done by network security specialists/ engineers who would be using functional kiosks and load them with orders that would then be pushed out all at once. This will also be occurring while peak McDonald's operations are taking place in order to test network capabilities in a real world environment with the network being used by patrons and other systems in the restaurants. The test will also help fulfil latency speeds and buffering in item selections and promotional video playback. The defect resolution process would halt all operations of the table tablet kiosk and to restore the legacy kiosk systems in its place until all networking issues have been resolved. During non operating hours network engineers would test and upgrade exciting hardware in the restaurants and complete a report stating what the issues were, why the issues existed and how it has been resolved. Once all requirements have been met, the portable table kiosks and the new ordering process can be reinstated.

Automated Inventory

The new automated inventory system strategy will be initiated with a 4-step testing process. It will begin with integrated testing that checks the data flow from one module to other modules to

see whether information such as inventory and stock levels are being updated in real-time with every purchased item in order to proceed with system testing. System testing is performed on a completely integrated system and allows checking the systems compliance by testing its overall interaction of components such as performance, load and security. Once the system testing phase is complete, we can proceed with the volume testing to find if requirements such as sales trends, forecast demand and discrepancies can all be identified and rectified when dealing with large volumes of stock. Acceptance testing is the last testing phase and it determines whether all requirements of the system are being met and reports are generated through auditing and previous tests indicating how much time, money and manpower is projected to be saved. Any bugs in the inventory management software will need to be addressed by the software developers prior to the acceptance testing phase in order to troubleshoot any issues before the final stages. The ultimate goal of this 4-step testing process is to ensure the inventory control process is optimized, stock-outs are prevented, saving time on manual stock-takes and ultimately responding to the dynamic trends of customer demand.

Cash dispenser

In order to test the efficiency of the cash dispenser, it needs to be tested rigorously to avoid any technical and security errors during customers' orders. Firstly, the dispenser needs to be able accept all types of physical currency accepted in the country the restaurant is located in. Trained staff must dedicate time to record multiple transactions using different coins and bills ensuring the dispenser accepts the right amount and dispenses the correct change each time. Human error can lead to individuals inserting less or more than the required amount. The dispenser should always show the correct amounts on the screen. To confirm this, employees need to test multiple times that the amount accepted or given back is corresponding to the amounts displayed on the screen. This guarantees that the company and the customer receive their fair share. The dispensers will undergo operational testing to measure rates at which each individual inserts their money, and the rates at which the machine accepts and returns applicable change. This testing will be completed by system engineers who have experience adjusting processes to be sufficient for the business' tempo and can exceed customer expectations with how fast the process works. With the dispenser being automatic, it must be adjusted to safely accept currency without harming customers. Customers must follow screen readings to stay clear when the dispenser opens, and they must confirm on the screen that they are done inserting or retrieving amounts for the register to safely close. System engineers must adjust the register opening and closing to give customers reasonable time to move back and safely interact with the kiosk. The system will also undergo a real-life test which will be closely monitored by trained McDonald's staff. During this exchange, customers will be allowed to interact with the kiosk and all its capabilities will be put to the test. This stage of testing will reveal any discrepancies that were not revealed when employees and third-party contractors were testing outside hours of operation. Every two kiosks will have a trained employee who will closely monitor and be ready to assist in any situation.

While monitoring interactions, employees will make sure that there are no technical or security flaws, the dispenser is performing safely and efficiently and whether the customer is satisfied with the order process.

TRAINING

Dispenser

Marmon Foodservice Technologies has provided in depth training and installation best practices in order for food chains such as McDonalds to perform an extensive training prior to commissioning the ABS dispenser. The testing process is intuitive and also comes with video components so that employees can be trained with visual aids prior to using the equipment on site. The manufacturer provides specific training on key areas such as software upgrades, error logging, machine services, operating instructions, and in depth training on the different features and adjustments which can be made as needed by the staff overseeing the operations of the ABS. In total viewing the material will take approximately 2 hours and live training on the machine will take approximately 4 hours. This will cover everything from when the machine is booted to scheduling the self service and cleaning times.

Portable Table Tablet/ Technology Support (guest experience)

Training for the portable table tablets would help ensure employees know how to operate the kiosks if any faults arise or if new customers do not know how to operate the kiosks. There will always be one McDonalds employee working at every shift ensuring that they have the knowledge of kiosks and to support any issues. This person would also be the Technology Support (guest experience) associate on site who would have both technical and customer interaction skills. The training format would be in a group setting, with all employees chosen to be Technology Support (guest experience) associates from the same district, being trained by the software engineers and project managers on how to operate the kiosks and how they help benefit the restaurant. The length of the training would be 1 day as there are not a lot of differences between the standstill kiosks and the portable kiosks. The menu system and user interactions will be very similar however, new features such as the table booking system and QR verifications will need to be trained thoroughly in order to ensure smooth and capable customer support. The training will include how to boot up the kiosks, how to fix network connection issues, how to push orders through when portable kiosks fail, and how to contact technicians if major issues regarding the operation of the portable kiosks arise.

Automated Inventory Management System

Employee's will be required to complete an Inventory management and Inventory control course which will consist of instructional videos, infographics and tutorials on how to become an expert on handling the updated inventory management system. This training will educate the employees on how the system works, why it's beneficial to McDonald's and the importance of this change. Some of the learnings include; how to access the system and its many functions, how optimizing inventory levels can reduce operational costs and reduce risk in your business. This training will take around 10-15 hours and will be handled in training waves based on employee availability. Managers and supervisors will be required to take additional training that will instruct them on how to update, reboot or run diagnostics on the automated system.

Cash dispenser

Training required for the cash dispenser will vary and employees are required to receive proper instructions to manage and maintain the cash dispenser to ensure that it is performing at its peak. Employees will know to turn the system on and make sure that the dispenser is filled with all the essential change (bills and coins) throughout the day. They will check on the machine every two hours to make sure that the kiosk is performing efficiently and the machine is filled with the sufficient amount of change. Employees must be able to fix any issues that affect the cash dispenser's performance (frozen screens, jams with the dispenser, incorrect change being dispensed, etc. Employees must be trained for a significant amount of time to ensure they understand the mechanics of the cash dispenser.

DOCUMENTATION

The implementation strategies will require certain documentation items in order to ensure that they are implemented and the change is adopted by the stakeholders involved. Having specific documentation is essential to execute on any project as they ensure all effectively implemented without any granular aspect of the project falling through the cracks. In addition to the standard documentation which will be required. Each prototype will have specific documentation which may be required in addition to the core documentation items.

Project Charter

The project charter will formalize a schedule in which the project team and other stakeholders will need to adhere to in order to deliver the project in a timely manner. The project charter will enable the project managers involved in the implementation of their specific prototype to build the business case and outline the items listed below:

- Scope of the project
- Requirements
- Timeline

- Budget
- Resources
- Completion and success criteria

The project character will support communication and remove any overlap between the various cross functional teams supporting the project.

RACI Matrix
The RACI Matrix is one of the most essential parts of the project and project documentation. It will clearly define who is **r**esponsible, **a**ccountable, **c**onsulted, and **i**nformed on each task throughout the project. Mapping this matrix will reduce confusion, uncertainty and effectively distribute the workload to the appropriate individuals; as a result, overall efficiency will increase and the projects will remain on track. In the event that any issue arises, the teams will know exactly who is responsible to resolve the issue.

Risks and Issues Log
This log will list all known issues and risks that the projects could potentially face during implementation. Additionally, this will outline the impact, probability, proposed remedy, and the owner/individual who will be accountable in the event such an issue arises.

Project Communications Plan
The project communications plan will define required communications between the project team and the stakeholders. This will include defining the communication channels as well as what will be communicated and prescribing timelines/occurrences for desired communications. This can include weekly or biweekly reports. In addition, the project communication plan will assign responsibilities to team members.

Change Request Management
This document will track any additions or alterations which were not anticipated in the deliverables agreed upon for project execution. This document will include a table that provides specific details on the out of scope or additional deliverables and will be shared with the project managers and implementation coordinators. Any changes will require authorizations by the project management team as they will need to adjust any ongoing or dependent work accordingly.

Project Schedule
The project schedule dictates what work needs to be completed and assigns its respective deadline. This document contains the timeframe of the project. As a result, targets, missed deadlines, and milestones can be tracked by the project management team. Depending on the

complexity of the schedule, tools such as Microsoft projects may be commissioned in order to accommodate scheduling requirements.

User Guide

User guides will be required in order to ensure that staff can refer back to a document in the event of any uncertainty when actively engaging any of the prototypes. Additionally, manufacturers provide their own user guides and outline any technical aspects of the prototype. If McDonald's technicians identify any issues they will be required to document and outline how a line staff can operate and resolve the issue. The guide will include written instructions with associated images making it intuitive to any staff considering the vast amount of employees at any given franchise

Dispenser

The party responsible for assembling the documentation surrounding the ABS dispenser will be the project manager. Since they will be working with all of the cross functional teams, they will need to ensure there is no loss of information during the handover process. The project manager will only need to provide a high level documentation of processes since there is a plethora of additional documentation provided by the manufacturer Marmon Foodservice Technologies regarding end-to-end set up for the ABS dispenser. This includes detailed video instruction in addition to written manuals outlining the steps required for installation and commissioning of the dispenser. The manufacturer also provides the warranty/replacement information so that McDonalds staff are aware of the steps to take in case of any malfunctions or major component failures for the ABS dispenser.

Portable Table Tablet/ Technology Support (guest experience)

The documentation provided for the portable table tablet project is a pamphlet style hand out outlining the major benefits and features of the portable table tablet kiosk and also a 4-6 page introduction, highlight, service command and interval report handed out to each Technology Support associate during training. This would give the know how to McDonalds staff in case of minor technical difficulties and also a procedure on what to do and who to contact in the ecen of major failures with the portable tablet kiosk.The party responsible for the documentation creation for the technology support associate would be the project manager who would have to work with all parties involved in the implementation process of the portable table tablet kiosk.

Automated Inventory Management

The software developers and project managers would be the two parties responsible for documentation of the updated inventory management system. The developer team will be required to create a manual for the managers and supervisors that details the advanced commands and functions of the system. Advanced commands include; running diagnostics when downtime or other errors occur, how to override the system and how to schedule and check for updates. Instructional videos will also be accessible to follow along each step in the detailed manual. The project managers will be responsible for the documentation of the features, benefits and general commands in a brochure style handout which will be handed out to every employee during the training waves. Instructional videos for the service commands and resolving minor technical difficulties will also be available during the training sessions so each employee can follow step-by-step.

Cash Dispenser

The documentation provided for the cash dispenser assembly will be to the project manager and the retailer providing the dispenser will be responsible for the full setup with the IT department. After the full assembly and project manager will hand over daily operations documentation to the restaurant manager and staff and train them to encounter any other problems. In return the Cash Dispenser will give a daily documentation statistic on how many sales were made, how much coin/cash was taken. The Cash Dispenser will have to be dispensed at the end of each shift and the manager will cross check with the documentation provided by the dispenser to see if everything is correct.The Project manager will provide documentation on how to take the cash out and cross check in the most efficient way. The party responsible for the documentation creation for the technology support would be the project manager who would work with everyone to have the most efficient way.

CONCLUDING REMARKS

This project has introduced and taken a deep dive into the challenges and opportunities relating to the implementation of the McDonalds kiosk order system. Each process redesign as well as their respective implementation planning has been communicated with a high degree of detail. The planning and implementation of each new technology and process improvement has been enclosed with detailed explanation of how these strategies can be executed across franchise locations in Canada. Some considerations that are worthy of note for the process redesign are the improvement recommendations geared towards space optimization, restrictive payment options, and excessive queue times.

We have proposed solutions in the form of: (1) Portable table tablet kiosks to increase space optimization and excessive queue times which has the beneficial effect of increasing customer satisfaction and decreasing the amount of customers who back out of purchases due to the long lines. It also attracts customers who are technologically inclined and cater to new upcoming younger audiences that are growing up in this digital age. (2) The cash payment system greatly combats excessive queue times as well, while also eliminating the problem of restrictive payment options. This again has the benefits of increased customer satisfaction but more importantly it attracts new users to the kiosk which in turn will lower excessive queue times in a cyclic feedback loop. (3) The beverage dispenser system which deals with space optimization by way of clearing people out of the front counter as well as excessive queue times by shifting the labour of getting cups and filling drinks from cashiers to the customer themselves. The quick times would again increase customer satisfaction rate. (4) An automated inventory management system would allow managers or shift supervisors to focus on more pertinent issues instead of verifying product stocks.

The recommendation of space optimization through the re-positioning of kiosks and portable tablets will lead to a less congested store during peak hours. As the perception of long wait times from customers will also decrease in turn leading to more traffic in the store. The implementation of the kiosks will also provide the cashmere with more bandwidth to process customer orders at a faster rate as they will no longer need to support any customers using the kiosk order system with cash payments. Additionally, integrating the automated beverage system with the kiosks will lead to a more efficient ordering process as customers will not need to interface with the staff for their drinks. The order process will be reduced, only requiring the customer to pick up their food from the counter once their number is called. Also, by replacing the table tags with tabled kiosks, the need for dine in customers to enter the line will be eliminated.

In short, customer wait times were one of the main issues that McDonald’s needed to address. Several studies have shown that consumers that opted out of waiting in lines saved valuable time and got their products sooner. The development of the kiosk was marginally an innovation that was much needed as traffic in McDonald’s restaurants is uncontrollable by cashiers alone.

Customers using the kiosk and the new table kiosks will benefit by receiving their food sooner, more space optimization in the store making store traffic easier to regulate, and lastly corporate culture will be more manageable.

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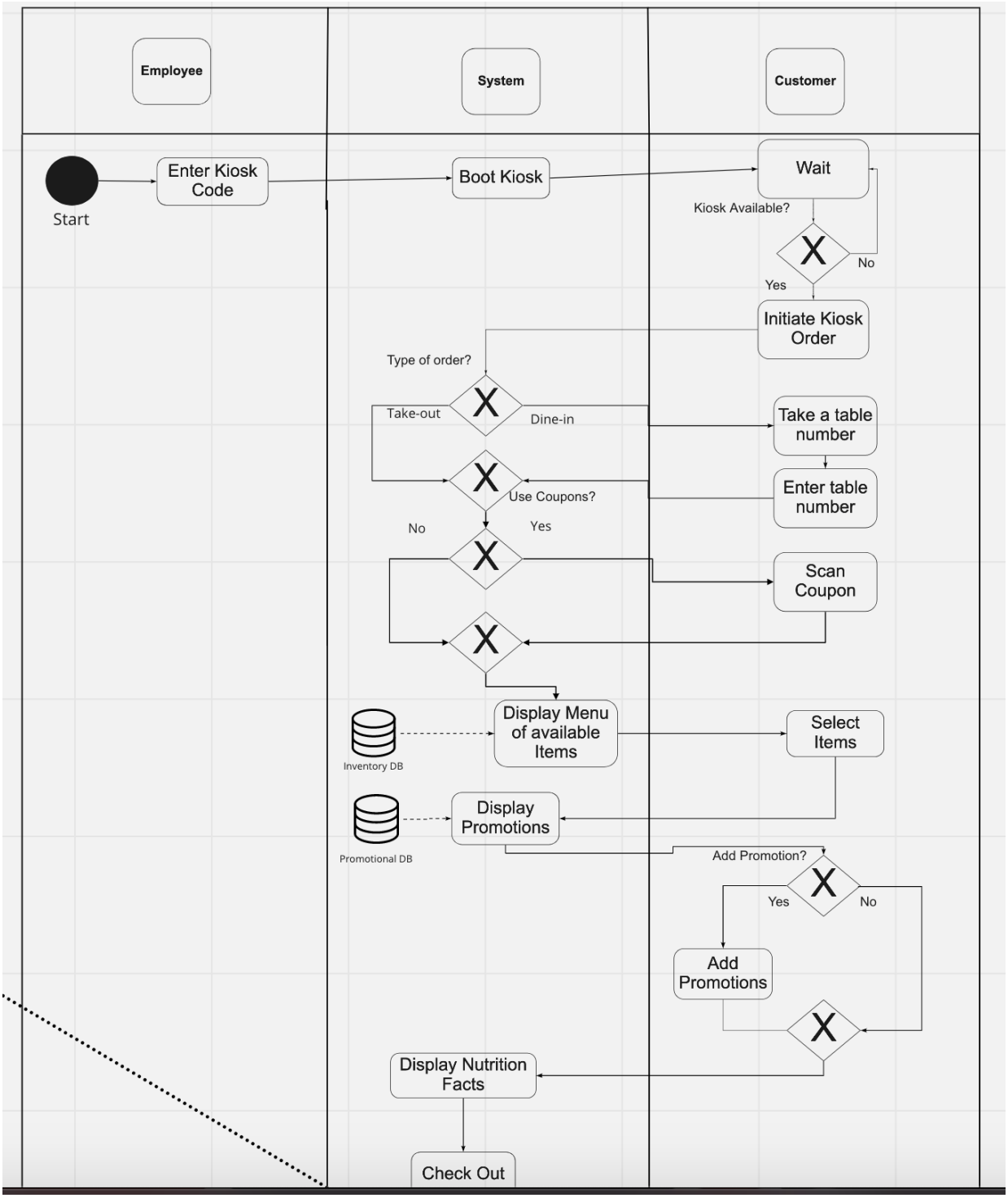
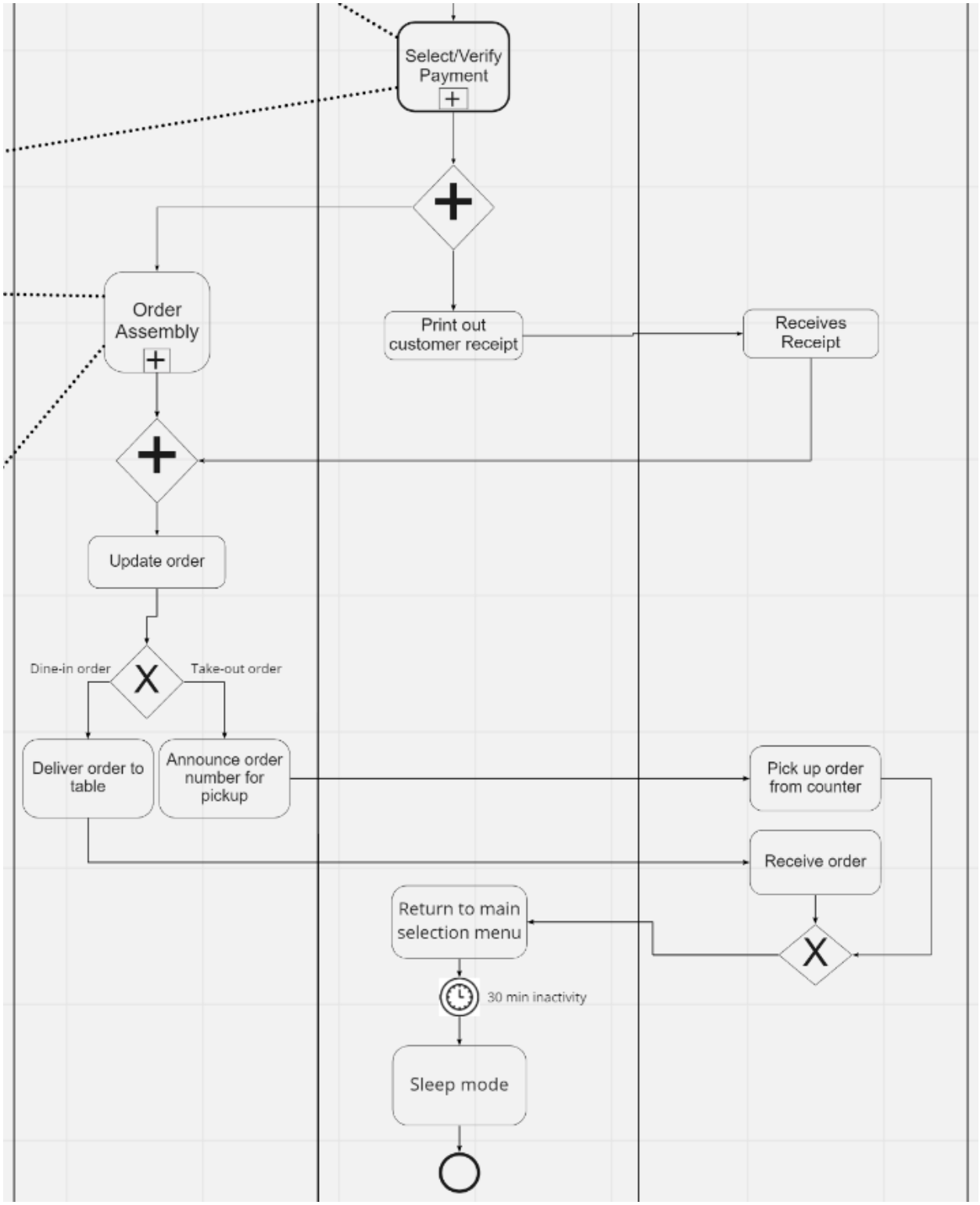
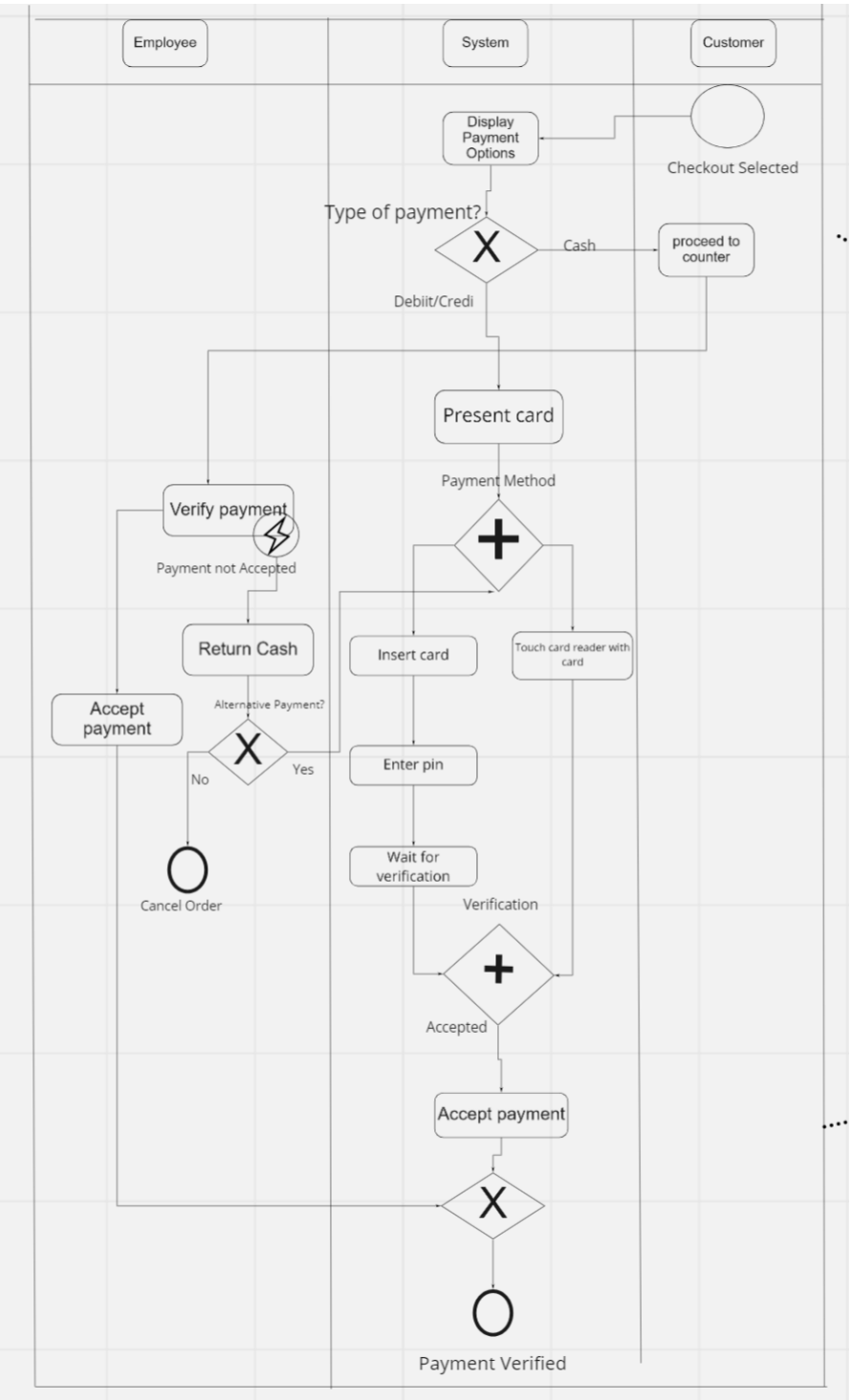
APPENDICES

Existing Kiosk Order Process BPMN Diagram (Figure 1)

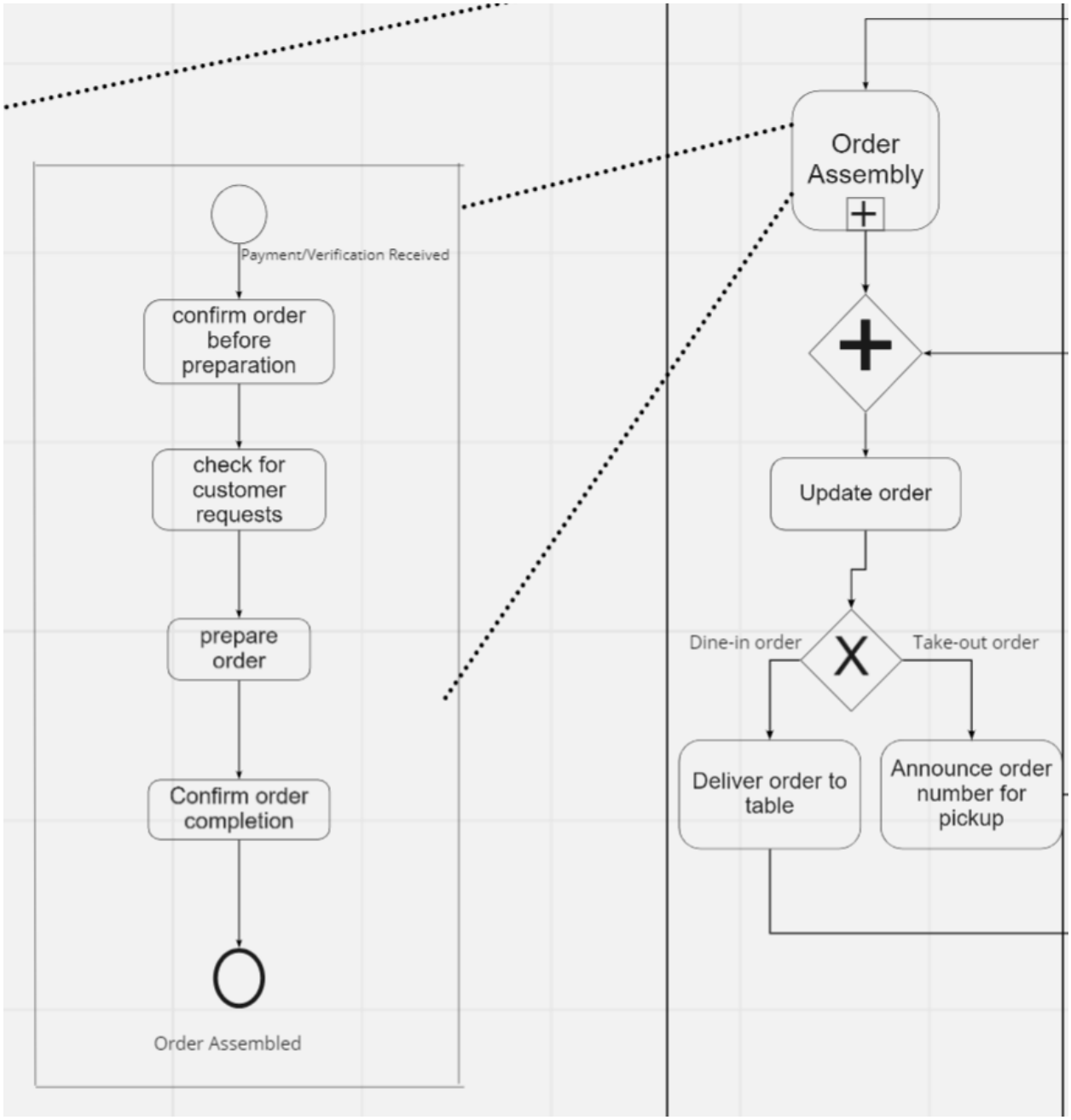



Select/Verify Payment
Order Assembly
Print out customer receipt
Receives Receipt
Update order
Dine-in order
Take-out order
Deliver order to table
Announce order number for pickup
Pick up order from counter
Receive order
Return to main selection menu
30 min inactivity
Sleep mode

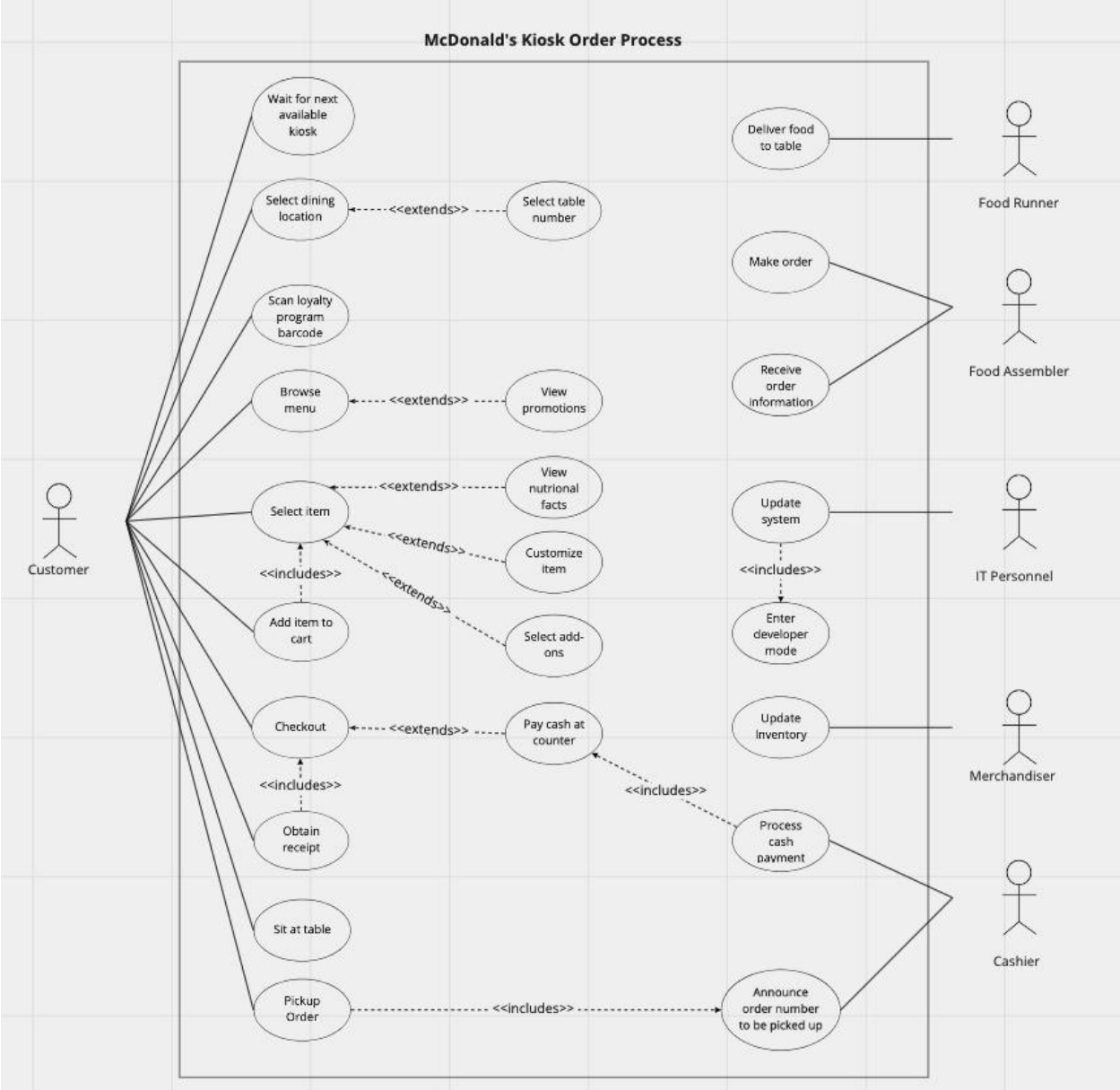
Existing Select Verify Payment Sub-Process (Figure 2)



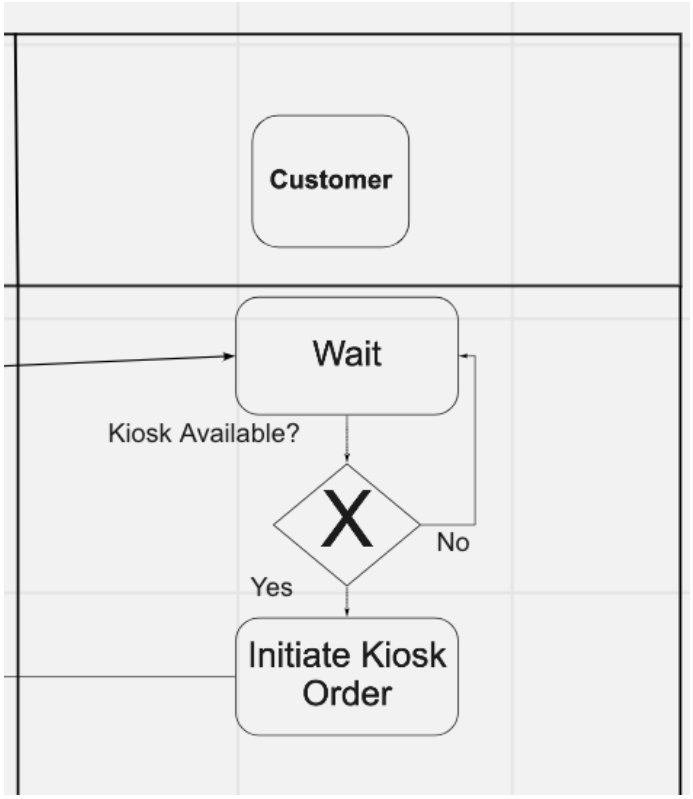
Existing Order Assembly Sub-Process (Figure 3)



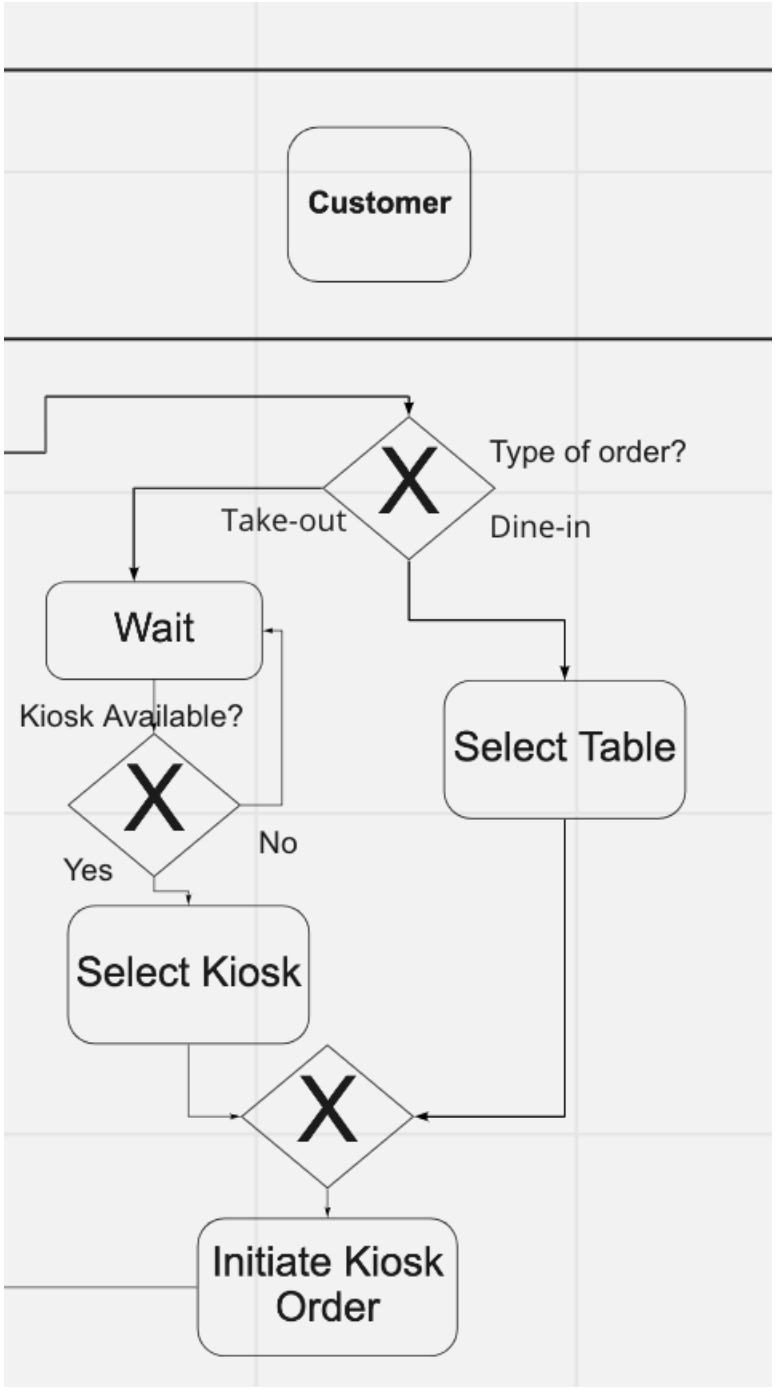
Existing Kiosk Use Case Diagram (Figure 4)



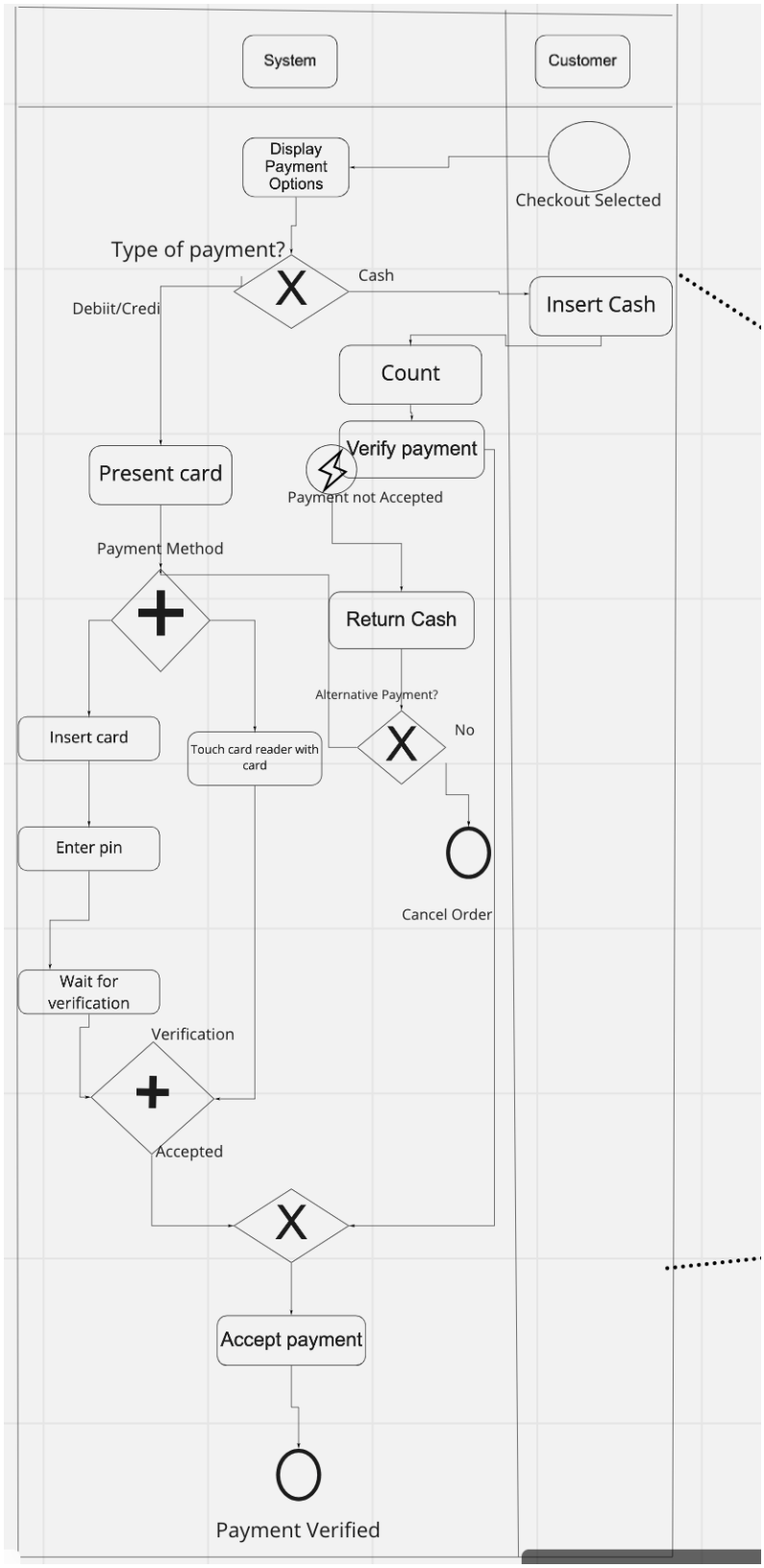
Customer Wait Process (Figure 5)



Customer Wait Process Redesign "Customer Kiosk Access Process" (Figure 6)



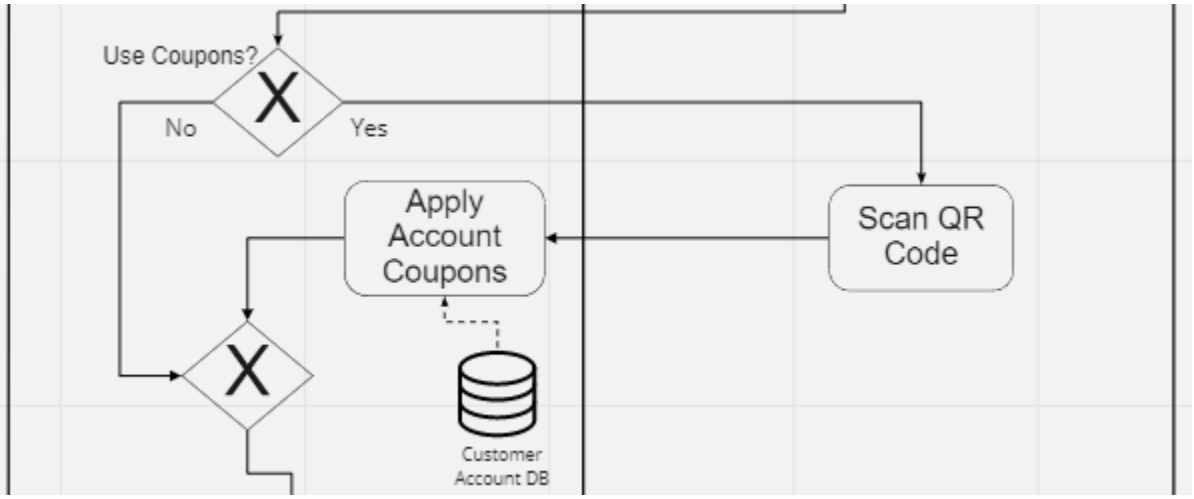
New Cash Payment Option Process (Figure 7)



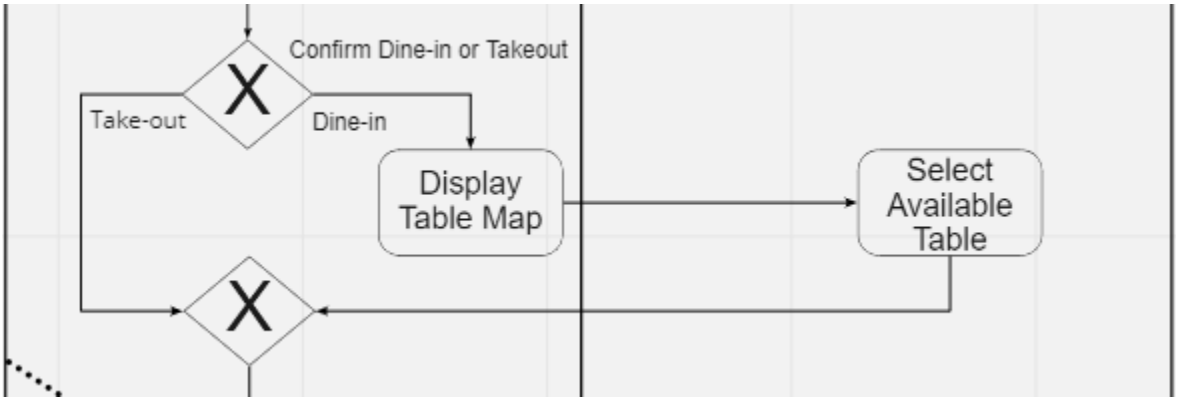
Risk Tracker Table (Figure 8)

Risk ID	Title	Impact	Likelihood
R001	Power outage	5	1
R002	Receipt printer failure	3	2
R003	Scanner failure	1	3
R004	Network outage	5	1
R005	Data breach	5	2
R006	Broken touchscreen	3	1
R007	Software crash	3	3
R008	Outer casing damage	2	4
R009	Emergency kiosk update	3	2
R010	Severed data connections	5	2
R011	Outdated software	5	3
R012	Broken payment terminal	3	1
R013	Malicious barcode breach	5	1
R014	Skimming/Shimming	4	2
R015	KVS down	4	1
R016	POS Server down	5	1

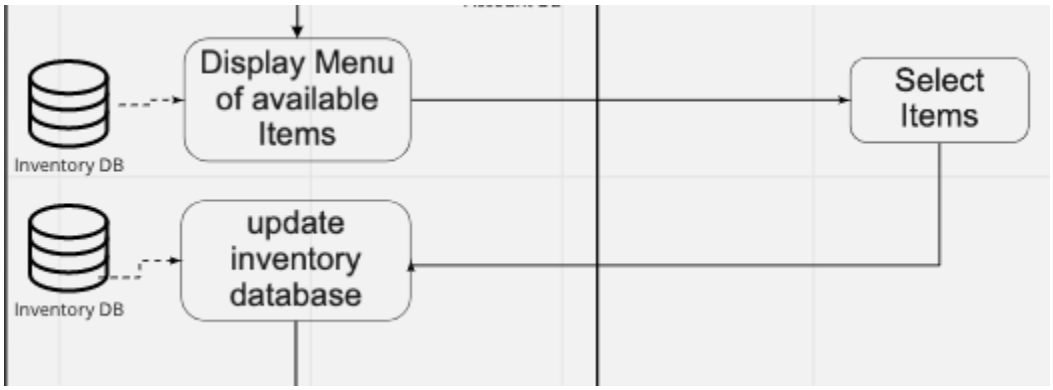
New Scannable QR Code (Figure 9)



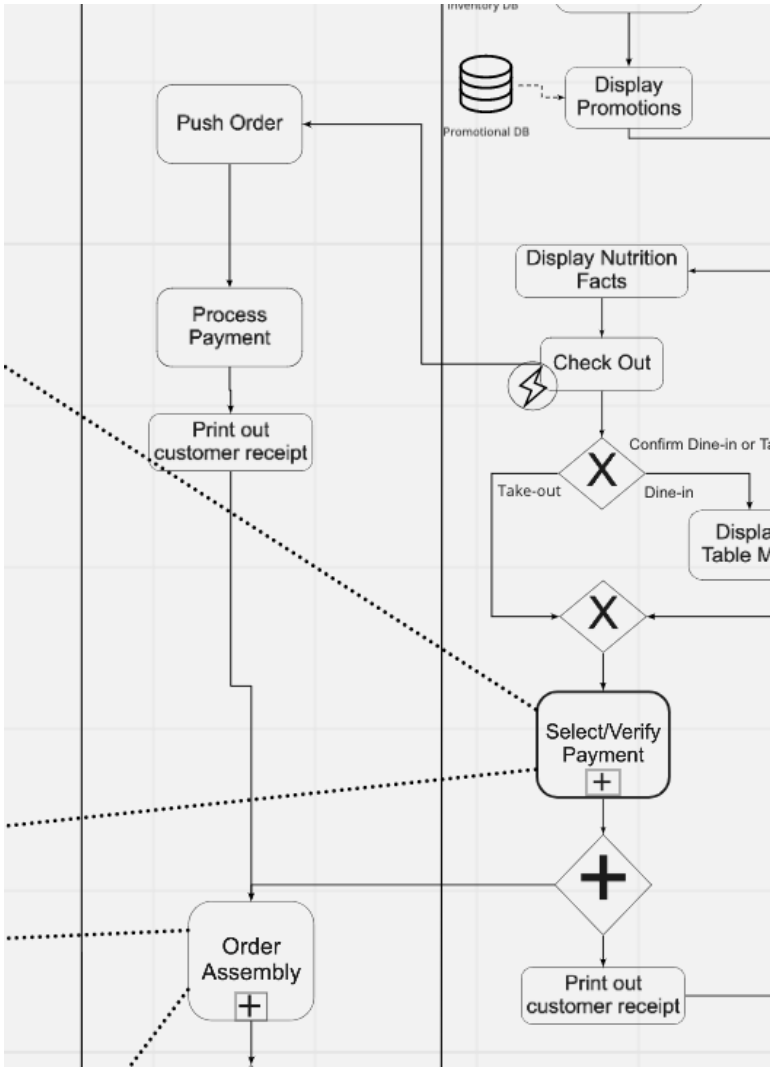
New Table Booking System (Figure 10)



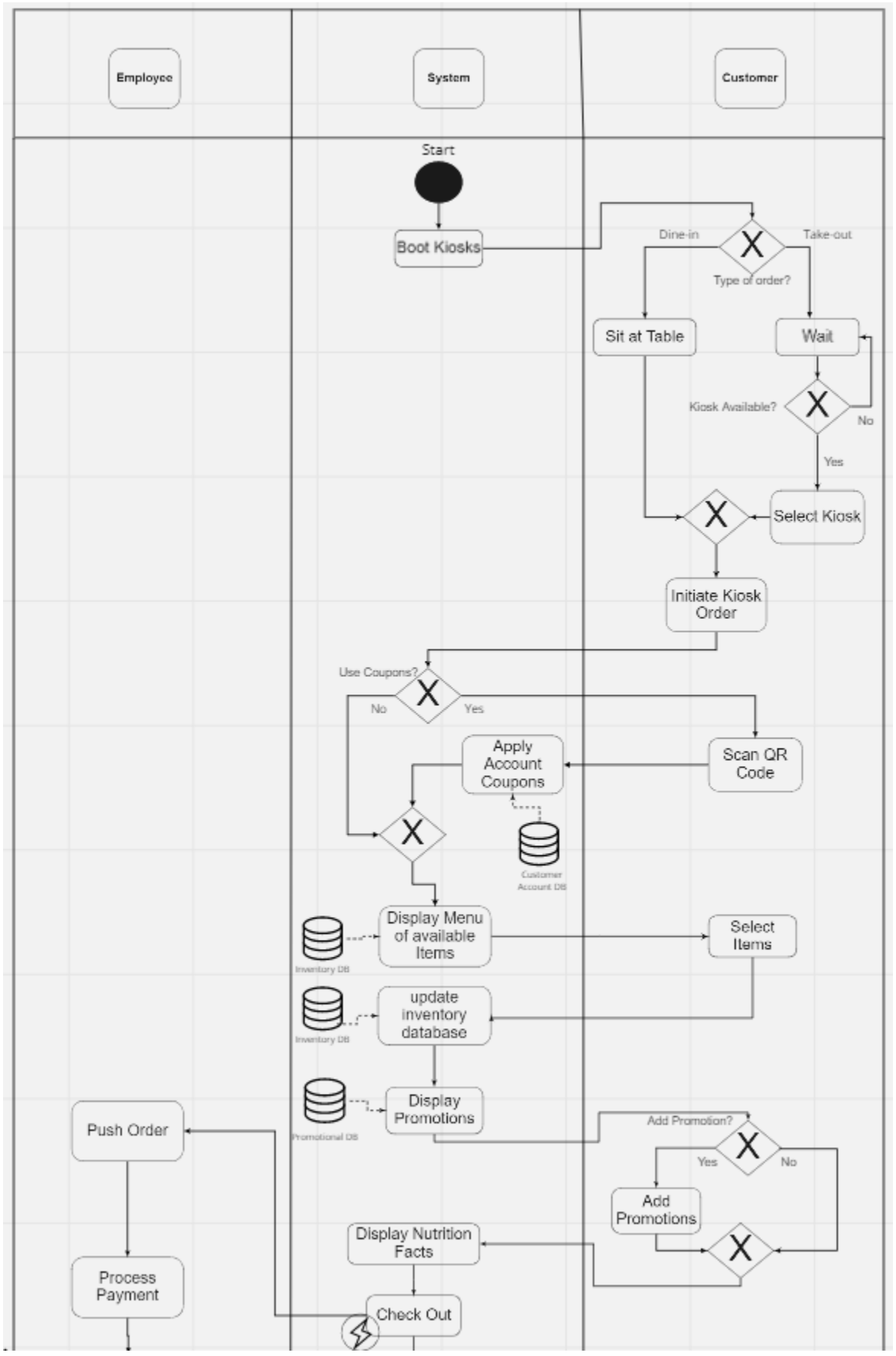
Automated Inventory Management (Figure 11)

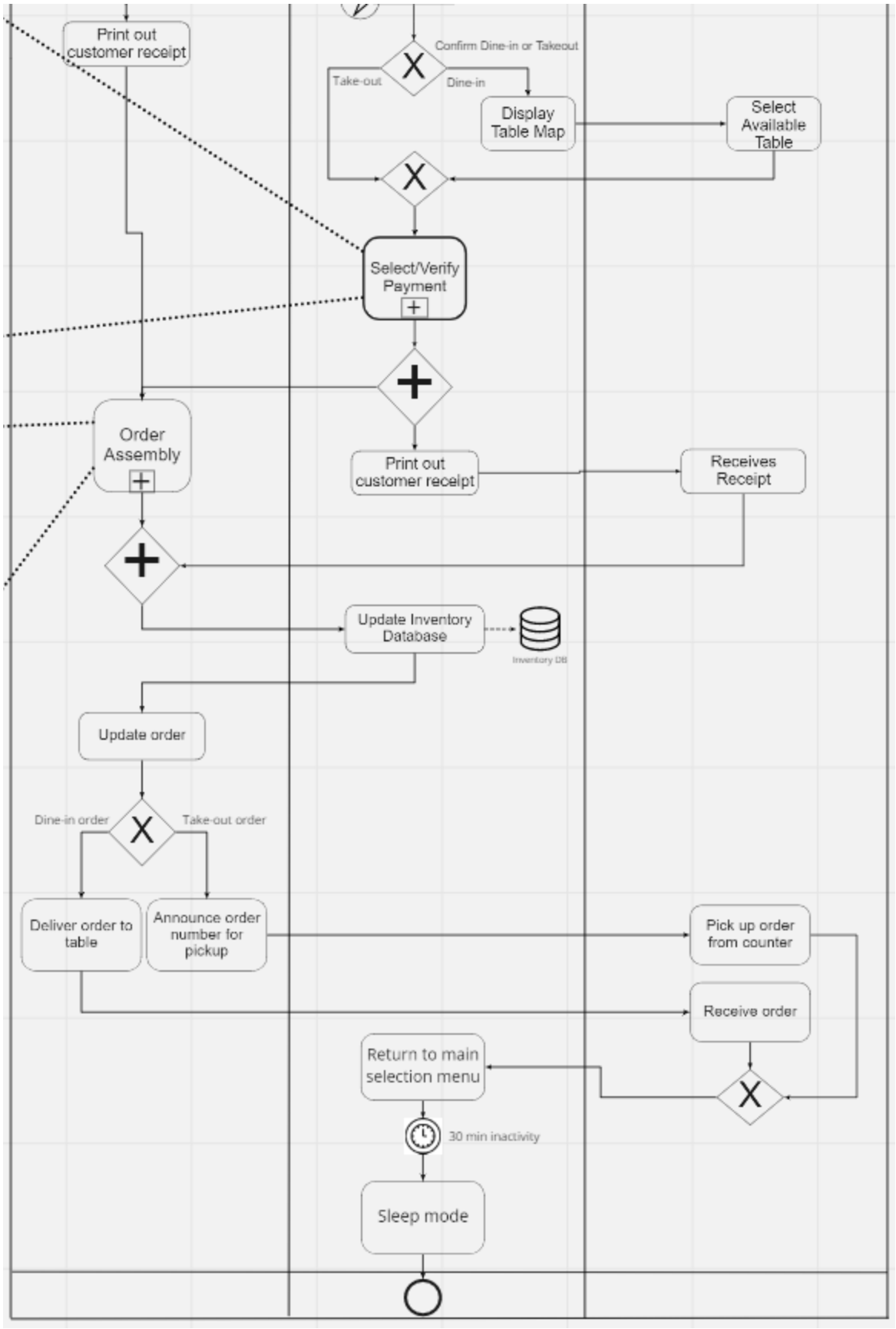


New Guest Assistance Process (Figure 12)

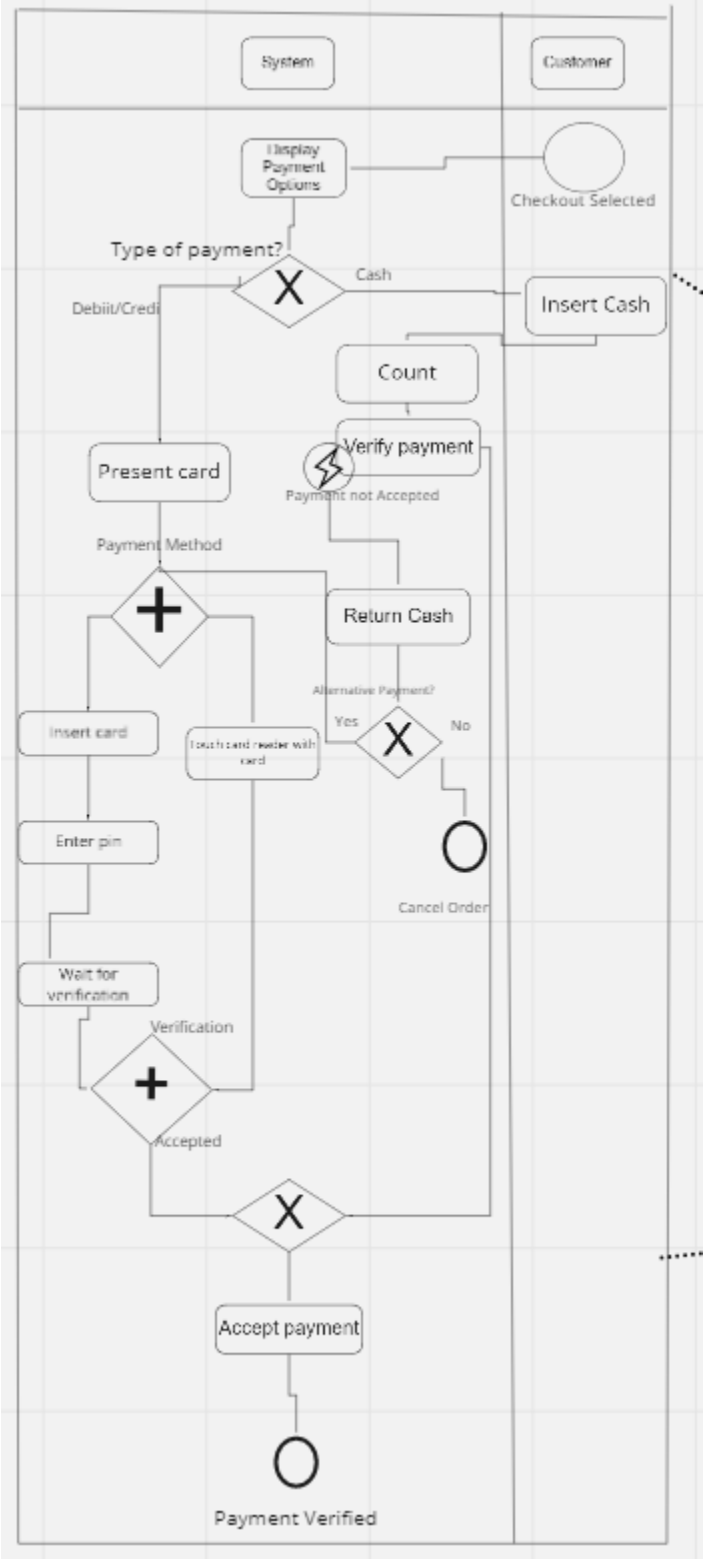


New Kiosk Order Process BPMN Diagram (Figure 13)




Print out customer receipt
Confirm Dine-in or Takeout
Take-out
Dine-in
Display Table Map
Select Available Table
Select/Verify Payment
Order Assembly
Print out customer receipt
Receives Receipt
Update Inventory Database
Inventory DB
Update order
Dine-in order
Take-out order
Deliver order to table
Announce order number for pickup
Pick up order from counter
Receive order
Return to main selection menu
30 min inactivity
Sleep mode

New Select Verify Payment Sub-Process (Figure 14)



New Order Assembly Sub-Process (Figure 15)