

A Smart Shopping System

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Abstract

Our goal is to mobilize the self-checkout experience at grocery stores. Customers will use a smartphone app as they go about their shopping. The app is a complete system which allows customers to register and login to start up the app. Once they are inside, the customer will be able to scan items by barcode, at items by weight via an internet-enabled digital scale, pay on their phones without waiting in line, and then safely exit the store through an intelligent security system. This solution will ease the customers shopping experience and hopefully prevent customer frustration while saving businesses money.

Problem Statement

Time is of the essence in the grocery store business. People can get frustrated by long queue times and leave, and businesses can lose money by keeping too many employees on hand. Research clearly indicates that businesses overall suffer from lengthy queue times. The clearest requirement for any solution to this problem is to address the customer's perceived time spent in checking out, and make the new alternative worth their time.

A study by ClickSoftware [1], a workforce engagement firm, has estimated that U.S. businesses lose around \$130 billion of potential business per year from bad customer service experiences. This staggering number is reinforced by other research which indicates that customers are generally highly irritated by wait times of over three minutes [2]. It must be noted, though, that what most irritates customers is not an extended wait time, but the idea that they have to wait for an unfairly long time while someone else gets service faster - for instance, imagine the frustration of going to the checkout at a store and having to pick between two equal lines, then having several difficult customers in front of you while the other line moves along expediently.

There is even a specific term for the amount of time people waste trying to collect all their items after being successfully checked out; this is called "faffing" [3]. Customers are highly subject to queue rage when they are required to wait a longer time because of someone (or multiple people) faffing in front of them- and when forced to wait for service, around half of those customers are likely to immediately assume the business is poorly managed, and might not be returning to that store. Really, the problem is more the *perception* of time wasted than the actual length of time.

Solution

Our proposed solution is going to ease the overall shopping experience for the customer by making the checkout experience a mobile platform. Now, customers will be able to scan items as they move through the store, in a timely manner, on their own smart phone with our mobile app. This app will track items on the order and will interface with a digital scale, mounted on the shopping cart itself, to allow produce purchases. At the end of the shopping experience, the app will transfer payment to the store as well as inventory information. The cart will have additional security features, including but not limited to a broad tracking method, which could also be used to help lost children locate their parents, and a transmitted alarm system which will be triggered if the cart leaves the store without authorization.

With regard to customer needs, the customer requires some type of security in the form of a system to track the carts. Additionally, the customer requires an alarm system that will prevent shoppers from leaving the store without having their carts and contents checked. The customer would prefer that the app be easily interfaced with a particular store location so that inventory and sales information regarding purchases can be tracked and recorded.

The System

Our proposed solution primarily consists of three main subsystems: a phone application, for user interaction; a security system, to allow customers to safely leave the store; and a digital scale, for the purchasing of weight-based goods.

Phone Application

The Application is one of the main components of smart shopping system. This is what will connect the customer to the system and be able to use the scale as well as the alarm system. Inside of this Application, customers will be able to create an account using an email verification and once they create an account be able to log in. If the smart shopping system would be used in an actual store, then the store would be able to use their own login system which would be implemented as well.

After the customer is logged in, they will have a few options to do. One is to use the barcode scanner to scan items to add to their cart list which would display what items they have and the price of them added up as they go.

Security System

The security system is crucial for the smart shopping system experience, ensuring that customers are leaving with *purchased* goods when exiting the store location. The system put into place will implement the usage of lasers on each side of the exit door that will trigger a mounted alarm system, which will also be mounted on the exit door. The alarm relies upon clearances via a fingerprint scanner that will be able to read employee fingerprints after they have verified that the entirety of the goods in the cart have been purchased by the customer, thus temporarily disarming the laser sensor and allowing the cart to pass by.

Digital Scale

Our digital scale originally had a serial port on the side for communication with a PC. We have repurposed this port to talk to an Arduino board instead, and have configured a WiFi module to allow the Arduino to transmit data over the internet. Thus, we have created an internet-enabled smart digital scale.

Conclusion

Reducing store wait times can improve customer satisfaction and business quality while saving money. There are a number of ways this can be approached, and our poster will present our method, which seeks to reduce wait times by mobilizing the self checkout experience. Where before people wasted time faffing in line, now they can control the pace of the checkout process. There will be no perceived unfair wait times. Our system will not be a perfect solution to all grocery store problems, but it can make a positive impact on this one.

Bibliography

1. Inc., "The Cost of Customer Service Wait Times"
2. Wall Street Journal, "Justice - Wait for it - on the Checkout Line"
3. Time Business, "Retail Shoppers: 3 Minutes to Checkout, or I'm Out of Here!"
4. Huffington Post, "Long Wait Times Harming Retail Experience, Survey Says"