DESIGN AND IMPLEMENTATION OF SELF CHECKOUT MOBILE APP

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INTRODUCTION

Self Checkout Mobile App is an app designed to modernize shopping experiences. This App allows customers to scan items, make payments and checkout without waiting in line.

STATEMENT OF PROBLEM

- Long wait times
- Customer Frustration
- Slow Checkout processes

AIM AND OBJECTIVES

The main aim of the app is to enhance shopping experience making it fast, efficient and user friendly.

Objectives;

- Reduce Checkout time
- Enhance Customer Satisfaction
- Improve store efficiency: Decrease workload on staff and reduce congestion at counters.

SIGNIFICANCE OF STUDY

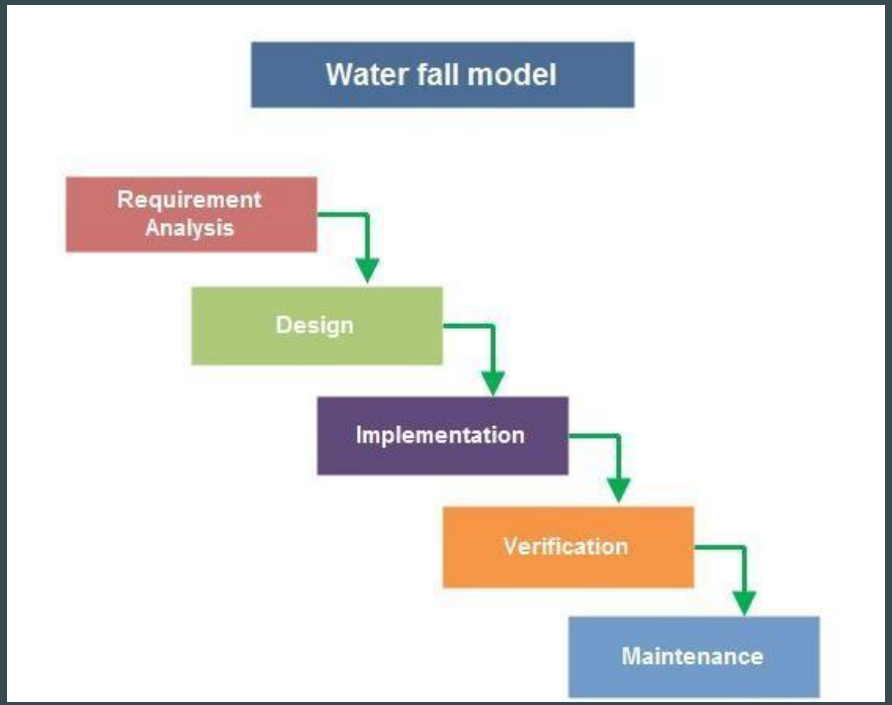
This study will demonstrate how technology can streamline the checkout process, making it faster and more convenient. Ultimately this study aims to show how a self checkout mobile app can create a win win situation for both customers and retailers.

LITERATURE REVIEW

Related Work	Method/Approach	Strengths	Weaknesses
Price Chopper Supermarkets (Inman & Nikolova, 2017)	Introduced the first self-checkout system in 1992. Customers scan, bag, and pay for their purchases independently.	▪ Pioneered self-checkout technology. ▪ Reduced labor costs and increased operational efficiency.	▪ Significant hardware and maintenance costs. ▪ Required floor space for dedicated kiosks.
Wal-Mart Pilot Program (Walker & Martin, 2018)	Adopted self-checkout systems in select stores starting in 1994.	▪ Validated the viability of self-checkout in large-scale retail.	▪ Early systems were still kiosk-based, leading to high setup costs.
Mobile-based Self-Checkout Solutions (Brown et al., 2020)	Used mobile applications for self-checkout, leveraging the BYOD (Bring Your Own Device) principle.	▪ Eliminated hardware costs. ▪ Increased flexibility and convenience for customers using their own devices.	▪ Depended on reliable internet connectivity. ▪ Faced challenges with user adoption and payment methods.
NFC and RFID Payment Methods (Lee et al., 2018)	Implemented Near Field Communication (NFC) and Radio Frequency Identification (RFID) payments to improve reliability.	▪ Enhanced security and efficiency. ▪ Did not rely on internet connectivity, improving payment reliability.	▪ Required investment in NFC/RFID technology. ▪ Limited to customers with compatible devices.

ADOPTED METHODOLOGY

The adopted methodology that was chosen for this project is the Waterfall Model.



WHY WATERFALL MODEL?

The waterfall model was chosen because it is less complex and straightforward. It allows us to move through the project in clear sequential steps: from gathering requirements, designing, implementing, testing and finally maintaining the app..

TOOLS USED

- Reactnative: Framework for building mobile apps using javascript and React.
- Firebase was chosen as the backend for this project.
- Firebase was chosen for the Database.
- Expo was chosen as the framework for reactnative.
- Vs code as the code editor.

FUNCTIONAL REQUIREMENTS

- This app allows Users to scan product barcodes.
- This app displays price of a scanned product and calculates the total cost.
- This app allow users to make payment and checkout.
- This app provides a digital receipt after a successful transaction.
- This app provides notifications and alerts for order updates.

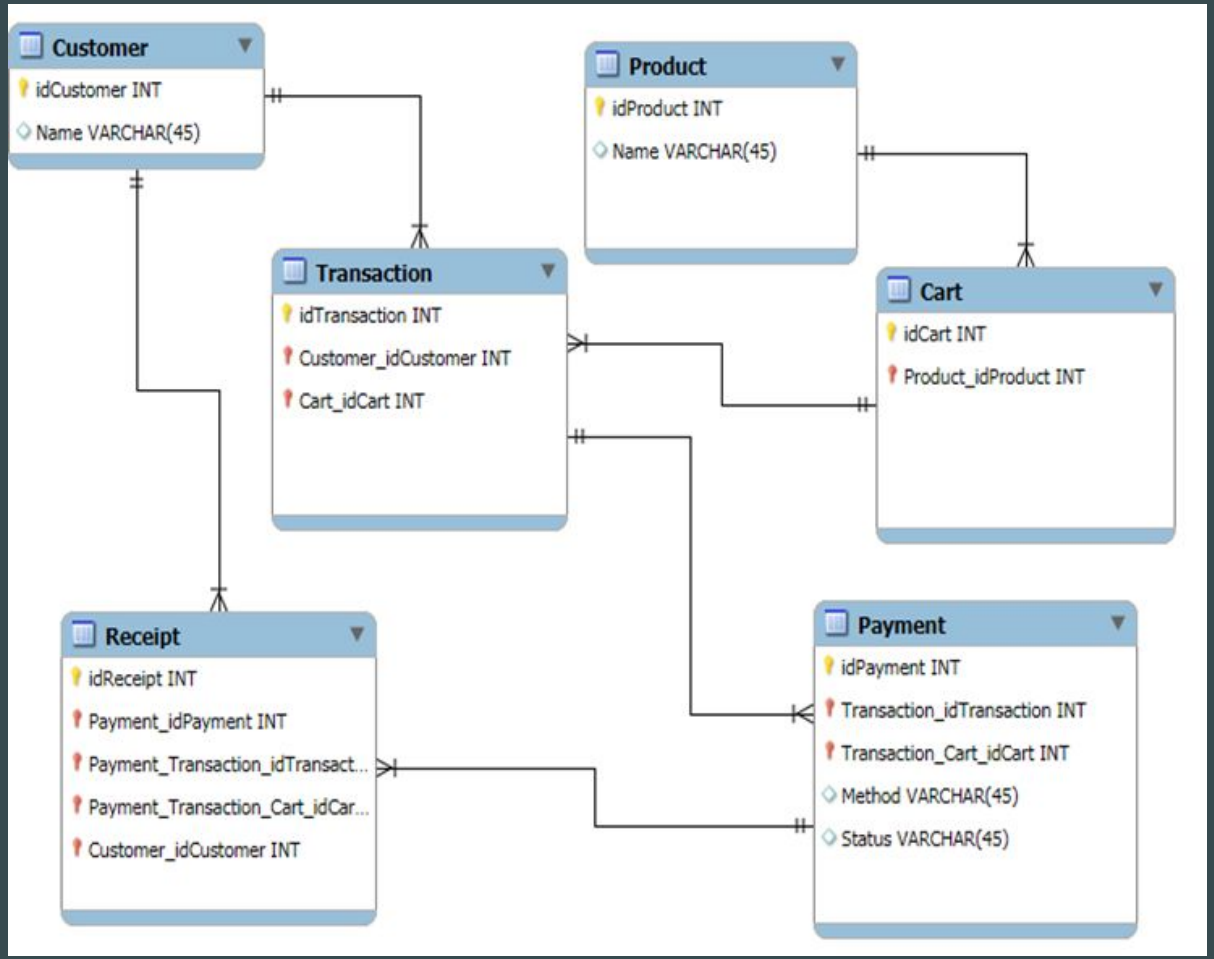
NON FUNCTIONAL REQUIREMENTS

- The app should be simple to use.
- The app should load quickly and respond promptly to user interactions ensuring a seamless checkout process.
- The app should be reliable and available with minimal downtime ensuring that users are able to complete their transactions.
- The app should be able to handle errors gracefully, providing clear error messages.

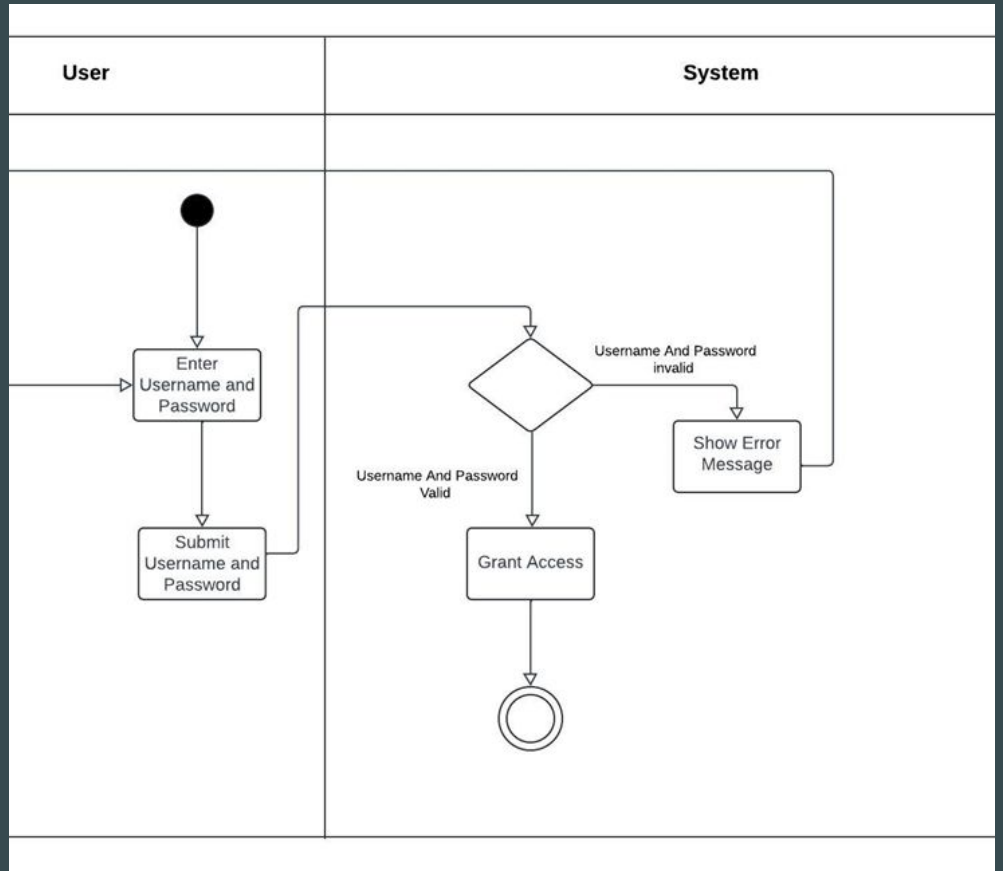
UML DIAGRAMS

Use case Diagram

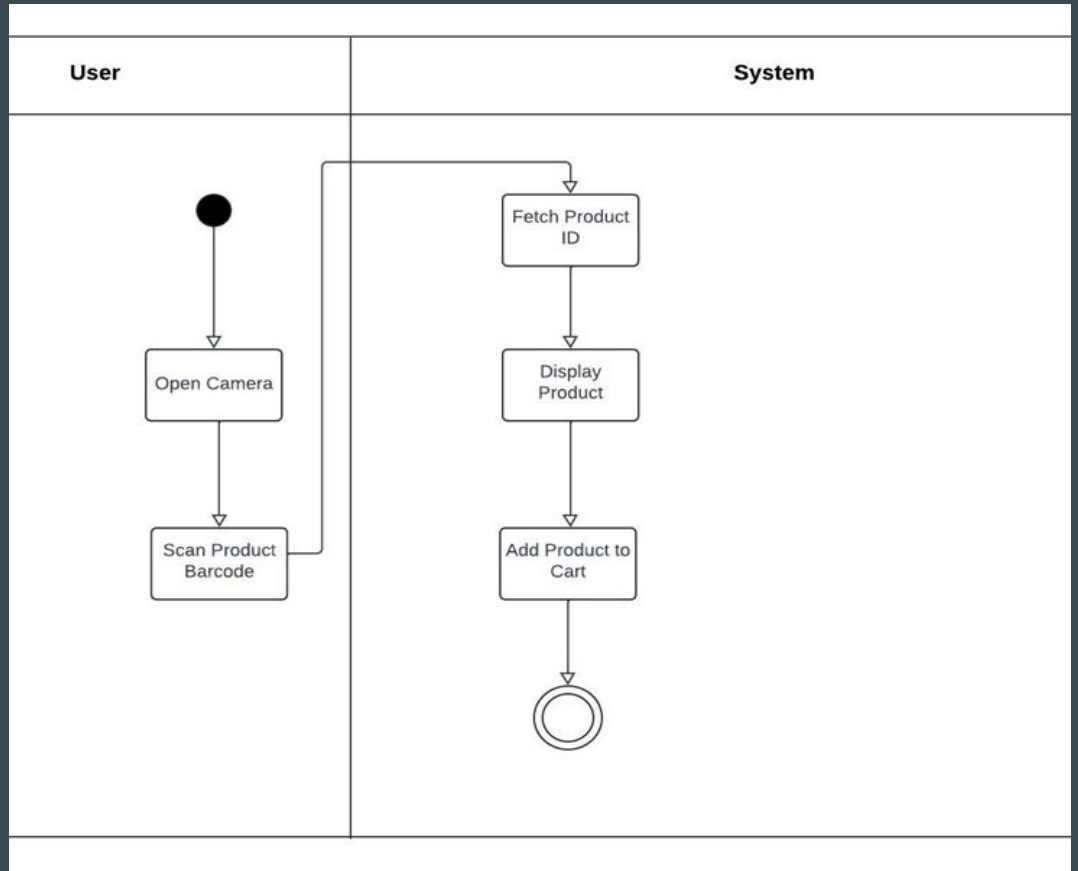
ER Diagram


Customer
idCustomer INT
Name VARCHAR(45)
Product
idProduct INT
Name VARCHAR(45)
Transaction
idTransaction INT
Customer_idCustomer INT
Cart_idCart INT
Cart
idCart INT
Product_idProduct INT
Receipt
idReceipt INT
Payment_idPayment INT
Payment_Transaction_idTransact...
Payment_Transaction_Cart_idCar...
Customer_idCustomer INT
Payment
idPayment INT
Transaction_idTransaction INT
Transaction_Cart_idCart INT
Method VARCHAR(45)
Status VARCHAR(45)

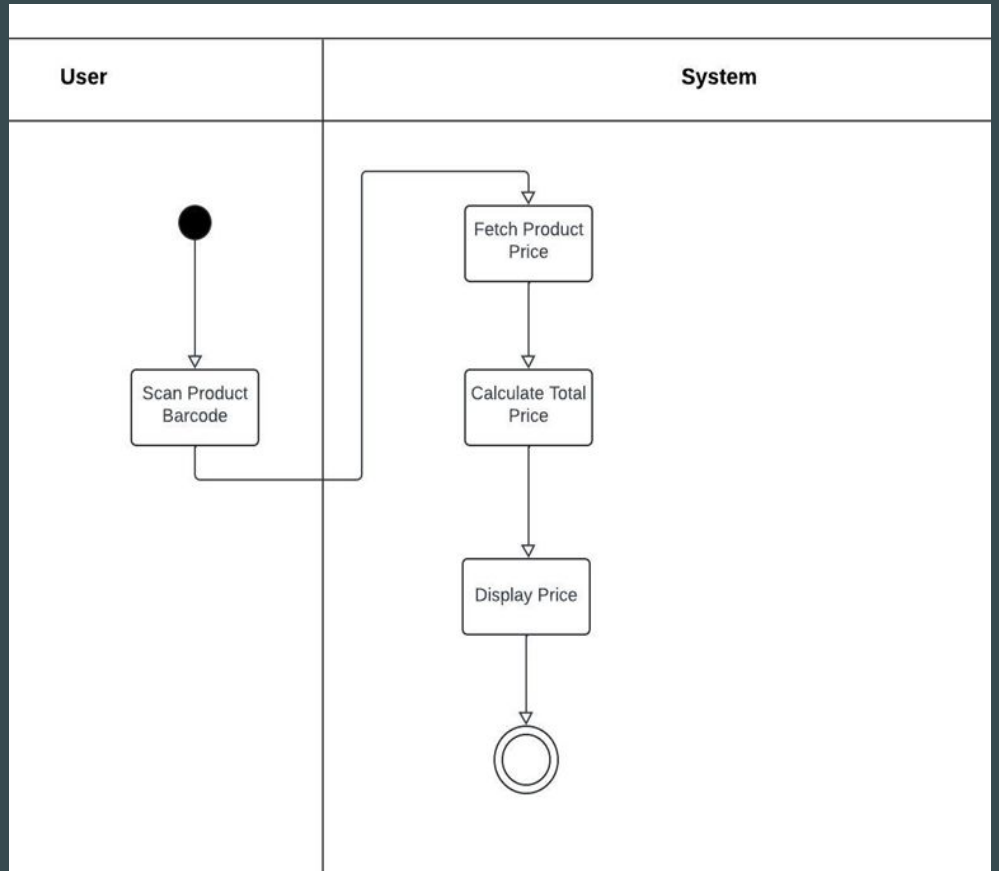
Activity Diagram for User and Authentication



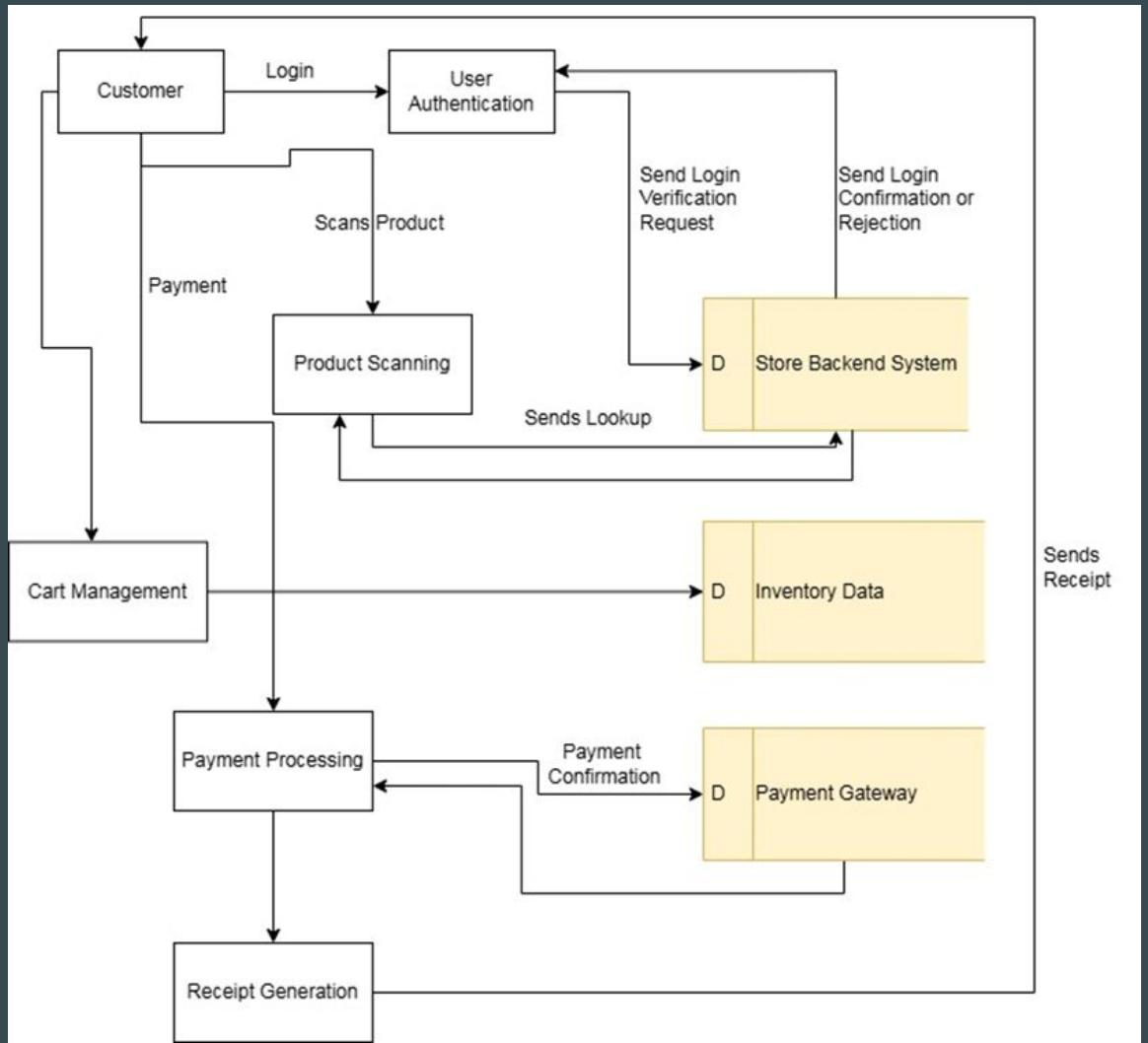
Activity diagram for Product Scanning



Activity Diagram for Price display and calculation



Data Flow Diagram



TESTING

- Testing was a critical phase in ensuring the functionality, reliability, and security of the self-checkout mobile application. Both functional and non-functional testing methodologies were applied to validate the system.

TESTING FOR USER AUTENTHICAT-ION

Test Case Description	Validate user authentication using email and password
Test Type	Security Testing
Preconditions	User has an account with email and password
Test procedure	1. Open the app. 2. Select "Login with Email". 3. Enter correct email and password.
Expected Result	User should be logged in successfully and granted access to the app's features.
Status	Pass

TESTING FOR BAR CODE SCANNING

Test Case Description	Verify bar-code scanning functionality
Test Type	Functional Testing
Preconditions	App is installed and running
Test procedure	1. Open the app. 2. Select "Scan" option. 3. Scan a product bar-code.
Expected Result	The app should accurately scan the bar-code and display the correct product details (e.g., name, price, availability).
Status	Pass

TESTING FOR ADD/REMOVING ITEMS FROM CART

Test Case Description	Test app usability for adding/removing items from cart
Test Type	Usability Testing
Preconditions	User is logged in and has items in the cart
Test procedure	1. Scan multiple items to add them to the cart. 2. Remove some items from the cart.
Expected Result	Items should be added and removed from the cart accurately, and the cart's total price should update in real-time.
Status	Pass

TESTING FOR SECURING PAYMENT.

Test Case Description	Validate secure payment encryption
Test Type	Security Testing
Preconditions	User is logged in and attempting a payment
Test procedure	1. Complete a transaction using any payment method.
Expected Result	Payment data should be encrypted during transmission, and no sensitive information should be exposed in logs or network
Status	Pass

TESTING FOR DIGITAL RECEIPT

Test Case Description	Validate digital receipt generation after payment
Test Type	Functional Testing
Preconditions	User has completed a payment
Test procedure	1. Complete a purchase using any payment method.
Expected Result	A digital receipt should be generated and displayed and should be shareable via email.
Status	Pass

CONCLUSION

In Conclusion, The Self Checkout mobile app aims to revolutionize the shopping experience by providing fast , convenient and user friendly solution. We ensure the app’s reliability and efficiency. By empowering customers with the ability to scan, make payments and leave, we enhance customer experience and satisfaction.

REFERENCES

Adams, B., & White, G. (2017). *Mobile self-checkout and its impact on traditional checkout lanes*. *Journal of Retail Operations*, 33(1), 12-28.

Andriulo, S., Elia, V., & Gnoni, M.G. (2015). Mobile self-checkout systems in the FMCG retail sector: A comparison analysis. *Int. J. RF Technol. Res. Appl., 6*, 207-224.

Asuquo, U. (2017). Mobile Self-Checkout Application.

Baker, C., & Clark, M. (2022). *Security considerations in mobile self-checkout apps*. *Information Security Journal*, 30(4), 321-336.

Baker, E., Clark, M., & Turner, S. (2020). *Mobile Payment Trends: The Rise of Self-Checkout Apps*. *Journal of Financial Technology*, 16(1), 12-27.

Barnes, K., & Parker, R. (2018). *Mobile self-checkout and its effects on impulse buying*. *Journal of Consumer Behavior*, 25(3), 167-182.

Beck, Adrian. 2022. Global Study on Self-checkout in Retail. Online. 13 March 2022. ECR. https://www.ecrloss.com/research/global-study-on-self checkout-in-retail/. Accessed 28 December 2022.

Beck, Adrian. 2022. Self-checkout in Retail: Measuring the Impact on Loss. Online. 1 March 2022. ECR. https://www.ecrloss.com/research/global study-on-self-checkout-in-retail/. Accessed 28 December 2022.

Brown, E. D., & Johnson, M. (2020). *Mobile self-checkout application (Thesis)*. *University of*

THANK YOU!