The Comprehensive Survey on Self-Check-Out and RFID Technology in Fin-Tech.

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Abstract—This survey looks at the changing trends in financial technology (Fin-tech), where traditional banking systems are moving to digital platforms, making services easily available worldwide through the internet. One notable aspect of this change is the use of Self-Checkout Systems (SCOS), also known as self-service technologies, allowing people to do tasks independently without help. SCOS are now widely used in many fields globally, making processes more efficient and saving time.The paper examines how SCOS are used in different industries, exploring the various applications and technologies involved. It looks at how these systems help simplify tasks, save time, and improve overall efficiency. Another critical aspect covered in the survey is data security, ensuring that information processed through self-checkout systems is kept safe.Looking forward, the paper predicts that self-checkout systems might become a part of educational institutions. This could make payment processes in schools and colleges simpler, showing how self-checkout technologies might extend beyond businesses. The focus on making payments easier and more streamlined highlights how Fin-tech trends are impacting various aspects of our daily lives, even reaching into the education sector for added convenience and efficiency.

Keywords—Fin-tech,Self-CheckoutSystems,RFID technology

A. INTRODUCTION

The evolution of financial technology (fin-tech), it's crucial to delve into how this digital transformation has impacted the traditional methods of buying and selling goods, particularly in the context of the historical use of cash systems and the role of mediators in facilitating transactions[3].In the past, commerce operated within the confines of physical currency, and the process of completing transactions involved intermediaries, often in the form of shop assistants or cashiers. After a customer made a purchase, they had to wait in long queues for the mediator to process their bill in a first-come-first-serve manner. This manual and sequential approach resulted in significant time wastage for both customers and the business.With the rapid growth of technology, especially in the finance sector, the landscape of these transactions has undergone a profound change. The amalgamation of technology and finance has given rise to fin-tech, a term that encapsulates a wide array of digital tools and solutions designed to streamline financial processes.Fin-tech, at its core, represents the digitization of financial activities. Instead of relying on traditional cash systems and manual billing processes, individuals and businesses can now leverage digital platforms, mobile applications, and specialized software to manage their transactions efficiently. This transition has not only eliminated the need for physical currency but has also significantly reduced waiting times and enhanced the overall customer experience[17].For instance, consumers can now make purchases using digital payment methods or mobile apps, allowing for swift and convenient transactions. The adoption of fin-tech has not only expedited the buying and selling process but has also introduced innovative financial services and products, ranging from online banking and automated investment platforms to digital wallets and contact less payments.In essence, the rise of fin-tech signifies a departure from traditional, time-consuming methods of financial transactions, bringing about a more accessible, efficient, and technologically advanced era in the management of money, encompassing aspects such as investing, borrowing, and saving. This digital revolution continues to reshape the way individuals and businesses interact with and handle their finances, marking a trans formative shift in the financial landscape.

Self-checkouts(SCOS) are automated systems strategically implemented in retail environments to empower customers with the ability to independently manage their purchases from start to finish. Found in various establishments such as retail stores and supermarkets, these systems eliminate the need for traditional cashier assistance during the checkout process.The genesis of self-checkouts can be traced to the increasing demand for efficiency within the retail sector. By providing customers with the means to scan, bag, and pay for items without queuing at staffed checkout lanes, these systems aim to significantly reduce wait times and enhance overall shopping convenience. Through the utilization of bar code readers, customers take charge of the transaction process, ensuring a more streamlined and autonomous shopping experience.Equipped with user-friendly touchscreen interfaces and integrated payment systems, self-checkouts guide

customers through the scanning and payment procedures seamlessly. This interactive approach allows users to select their preferred payment method, whether it's credit or debit cards, mobile payments, or even cash.

Integrating RFID (Radio-Frequency Identification) chips into student ID cards.When a student scans their ID card using a QR code, it activates a digital interface where various menus related to fee payments become accessible[14][16]. This technology allows students to navigate through the options and complete the payment process independently, without the need for intermediaries or additional assistance.

B. LITERATURE REVIEW

A. Self checkouts in Banks

Banks are starting to use self-checkout features to give customers more control over routine transactions. Although not as common as in retail, you can find self-checkouts in some bank branches. ATMs have been a form of self-checkout for a while, letting users handle tasks like withdrawing cash and checking balances independently. Inside banks, interactive kiosks allow customers to do things like pay bills on their own. Mobile banking apps make self-checkout even more accessible, allowing users to manage their money right from their smartphones. Automated deposit machines provide another way for customers to deposit cash or checks without needing help from a teller.[4][5] While not all banks have embraced self-checkouts, these changes highlight the industry's dedication to using technology for better customer service and more efficient operations.

B. Self Checkouts in pharmacies

Self-checkout systems are increasingly common in pharmacies, showcasing the industry's embrace of technological advancements. This innovation provides customers with a more efficient and convenient way to handle their transactions. In pharmacies, self-checkouts empower customers to independently purchase prescription medications, over-the-counter drugs, and health-related items without cashier assistance.[8] This not only reduces wait times but also ensures a sense of privacy, especially for sensitive health-related purchases. Furthermore, the incorporation of loyalty programs into self-checkout systems offers customers easy access to discounts and the ability to accumulate rewards points.[9] Although not universally adopted, the trend of introducing self-checkouts in pharmacies is growing, enhancing the overall customer experience in these crucial healthcare retail settings.

C. Self checkouts in food shops

Food shops are adding self-checkout options to make shopping more convenient. This innovation lets customers scan and pay for their items on their own, making the process quicker and more independent. [7][6]The shorter wait times at self-checkouts are especially helpful during busy hours when regular lines get crowded. Customers like the flexibility these self-checkouts offer, as they can be used for a variety of food items, from fresh produce to packaged goods. Additionally, loyalty programs are integrated into these systems, allowing customers to easily get discounts or earn rewards points. While not everywhere yet, more food shops are adopting self-checkouts, making the shopping experience more modern and flexible for customers in stores of all sizes.

D. Self checkouts in library

Self-checkouts in libraries empower patrons by allowing them to independently manage the borrowing and returning of library materials.[20] Users can utilize self-checkout kiosks to scan the bar-codes of items they wish to borrow, facilitating a seamless transaction that updates the library's database. [6][7]Authentication through library cards ensures that only authorized users can borrow materials, enhancing security. the library's management software ensures accurate recording of all transactions in the library's database, aiding .them to independently manage the borrowing and returning of library materials. Users can utilize self-checkout kiosks to scan the bar-codes of items they wish to borrow, facilitating a seamless transaction that updates the library's database. Authentication through library cards ensures that only authorized users can borrow materials, enhancing security. the library's management software ensures accurate recording of all transactions in the library's database, aiding in inventory management and item tracking. While self-checkouts promote independence, library staff are available to assist patrons with any questions or issues, striking a balance between self-service and customer support.

E. Self checkouts in Airports

Airport self-checkout systems, including check-in kiosks, baggage drop stations, security screening kiosks, and customs/immigration kiosks, are designed to streamline and expedite processes for travelers. Passengers can independently handle tasks such as printing boarding passes, checking baggage, and completing security procedures. Additionally, self-checkouts extend to retail and dining areas, allowing travelers to scan and pay for purchases autonomously. Boarding pass scanning kiosks at gates and self-service information kiosks contribute to an efficient airport experience. [12][13]Lounge access and lost-and-found services are also facilitated through self-checkout options, with multilingual interfaces catering to diverse international travelers. Overall, these systems prioritize reducing wait times, enhancing convenience, and elevating passenger satisfaction.

C. TECHNOLOGIES USED FOR SELF CHECKOUTS

Self-service technologies leverage a variety of technologies to enable users to perform tasks independently[11]. These technologies are designed to enhance efficiency, convenience, and user autonomy. Here are some key technologies used in self-service applications:

i. Bar-code Scanners:
Laser Scanners: Traditional laser bar-code scanners are commonly used to scan product bar-codes quickly.

Image Scanners: These scanners use image-based technology to capture and interpret 1D and 2D bar-codes, offering better performance and the ability to read bar-codes from mobile devices.

ii. Weight Sensors:
Integrated weight sensors are used to ensure that the items being purchased match the scanned items. This helps prevent theft by ensuring the correct items are in the bagging area.

iii. Touchscreen Displays:
Intuitive touchscreen interfaces allow users to interact with the self-checkout system, select products, and complete the checkout process.

iv. RFID Technology:
Radio-Frequency Identification (RFID) can be used to enable contact less scanning and checkout. Some systems use RFID tags on products for quick and accurate identification.

v. Cameras and Computer Vision:
Cameras and computer vision technology may be employed to monitor and verify the items being scanned. Some systems use visual recognition to identify items without the need for bar codes.

vi. Payment Systems:
Integration with various payment methods, including credit/debit cards, mobile wallets, and contact less payments, is a crucial aspect of self-checkout systems.

vii. Biometric Authentication:
Some advanced self-checkout systems incorporate biometric authentication methods like fingerprint or facial recognition to enhance security and streamline the checkout process.

viii. Bagging Area Sensors:
Sensors in the bagging area detect the weight of items and ensure that the correct items have been added to the customer's bag.

ix. Automated Cash Handling:
For self-checkout systems that accept cash, automated cash handling devices are used to count and process bills and coins.

x. Software and POS Integration:
Robust software is crucial for the seamless operation of self-checkout systems. Integration with Point of Sale (POS) systems is necessary for accurate inventory management and sales tracking.

xi. Security Systems:
Security measures, such as anti-theft mechanisms and surveillance cameras, help prevent shoplifting and ensure the integrity of the self-checkout process.

xii. Mobile Apps:
Some self-checkout systems allow users to use their mobile devices as a scanning tool, letting them scan items with their phones and complete the payment through a mobile app.

D. CHALLENGES AND GAPS

Understanding the specific reasons for the gap in implementing self-checkouts in educational institutions would require further research, potentially involving surveys, interviews, or case studies to gather insights from stakeholders. Addressing these challenges could pave the way for the effective integration of self-checkout systems, bringing efficiency and convenience to administrative processes within the educational sector.

E. CONCLUSION

The absence of self-checkout systems in educational institutions reveals a complex interplay of factors that have hindered their widespread adoption[3]. The identified challenges, including the complexity of transactions, security concerns, resource constraints, resistance to change, a focus on educational priorities, lack of awareness, and customization challenges, collectively contribute to the existing gap. Addressing these challenges requires a strategic and comprehensive approach to

bridge the divide between the benefits offered by self-checkouts and the specific needs and dynamics of educational environments.

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