Accelerating and Simplifying Checkout with RFID Technology

Designing the Walmart Retail Store of 2030

Walmart × TKS

Accelerating and simplifying checkout with RFID technology

Executive Summary

Problem

Checkouts are slow and complicated, creating frustration and turning away shoppers.

Consumers are **time starved**, and waiting in lines for cashier checkout is a waste of their time. Current self-checkout offerings are also not seamless, have a high learning curve. More than 50% of shoppers find them **too slow**, and 40% cite technical issues as the most **frustrating element** of their shopping experience. In 21% of cases, shoppers begin to **avoid stores** for having long checkouts times.

Solution

New and simplified self-checkouts that use RFID tags to automatically scan baskets and carts.

Our recommendation, *Fast*-Tag, consists of labelling all products in the store with an **RFID tag**, and installing **self-checkouts** to scan these tags. This drastically increases checkout speed by:

- Scanning **all items at once** using RFID technology.
- Simplifying the self-checkout experience by **reducing** the number of **steps.**

Results

1 minute checkout times, saving **2.1 billion hours** of waiting per year.

Shoppers no longer need to allocate 10 minutes to check out, which gives them **more time to shop** calmly and creates a **magical experience**. This builds a **less stressful** work-environment for associates helping with self-checkouts. Installing these tags also opens doors in **inventory management** and **theft-reduction**, potentially saving over US$2.2B.

MATH + SOURCES

What we are trying to solve?

The Problem

Checkouts are too slow and are driving customers away.

In Canada and the US, the two main types of checkouts both have issues: employee-run checkouts have lines that are too long, and self-checkouts are frustrating and complicated. 43% of people say their shopping choices are affected by wait times, and it could even make them avoid stores all together.

- Employee-run checkouts are prone to long lines during rush hour. This harms the customer experience and makes shopping at Walmart less attractive to people with busier schedules.
- Self-checkouts can be faster, but still frustrating to use. Customers reported security features like weight sensors slowing down their checkout and creating friction.
- While online shopping solves these problems, many customers enjoy in-person shopping experience and some products can't be sold online.
- This will become even more of a problem in 2030 because trends show free time is decreasing, and consumers are expecting to shop faster.

The average Walmart customer

Meet Stephanie

This is Stephanie Lapierre, an average Walmart customer. Her main priority when shopping at Walmart is to get in and out of the store quickly, continuing on with her busy schedule.

Let's follow Stephanie's Walmart shopping experience:

1. Stephanie is a busy mom of three, so her priority is getting in and out of Walmart as fast as possible. She shops at Walmart because of their low prices, as well as the convenience of having everything in one place.
2. She finds long lines at checkout frustrating, especially when they are moving slowly.
3. She uses self-checkouts when they're faster, but finds it annoying when security measures slow her down at the checkout process.

About the technology

What is RFID?

A handheld RFID reader from Zebra

Radio Frequency Identification (RFID) is a technology that uses a reader to detect special tags using radio waves. These waves mean that the sensor can detect tags not in the line of sight and through objects, while not posing any risks to consumers. RFID scanners are also more than 99% accurate.

1 Reader Emits Radio Waves

The **tag reader** sends out a pulse of radio waves (RF) to activate all the tags in a small area

2 Tags are Isolated

Using algorithms, the reader is able to **communicate** with individual **tags**

3 Tag Responds with Identifier

The RFID **tag responds** with its identifier (meaningless to external observers), telling the reader which product is being scanned

4 Reader Detects Response

The reader picks up the tag's response and decodes it to add the product to the "cart"

This technology is abundantly used in daily life without consumers even knowing it: from credit cards to libraries, race bibs and even livestock tracking.

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Implementing RFID technology

Our Solution

Fast-Tag

1

Label All Products with RFID Tags

Work with partners and stores to label each product on the shelves

2

Faster Self-Checkouts

Using RFID scanners inside checkouts, we can scan entire baskets at once, saving time

3

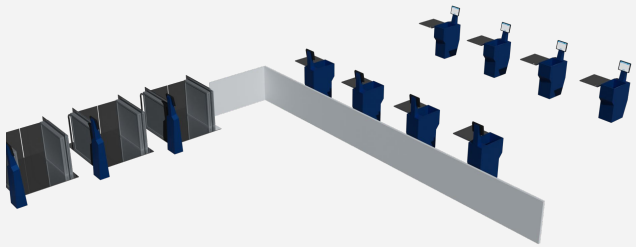
Simpler Self-Checkouts

Automatic scanning reduces the complexity of self-checkouts, removing the learning curve

4

New Opportunities

RFID-enabled stores allow us to explore new opportunities in inventory management and anti-theft technology



New Self-Checkout Visualization
(learn more here)

Overview of the enhanced consumer shopping experience

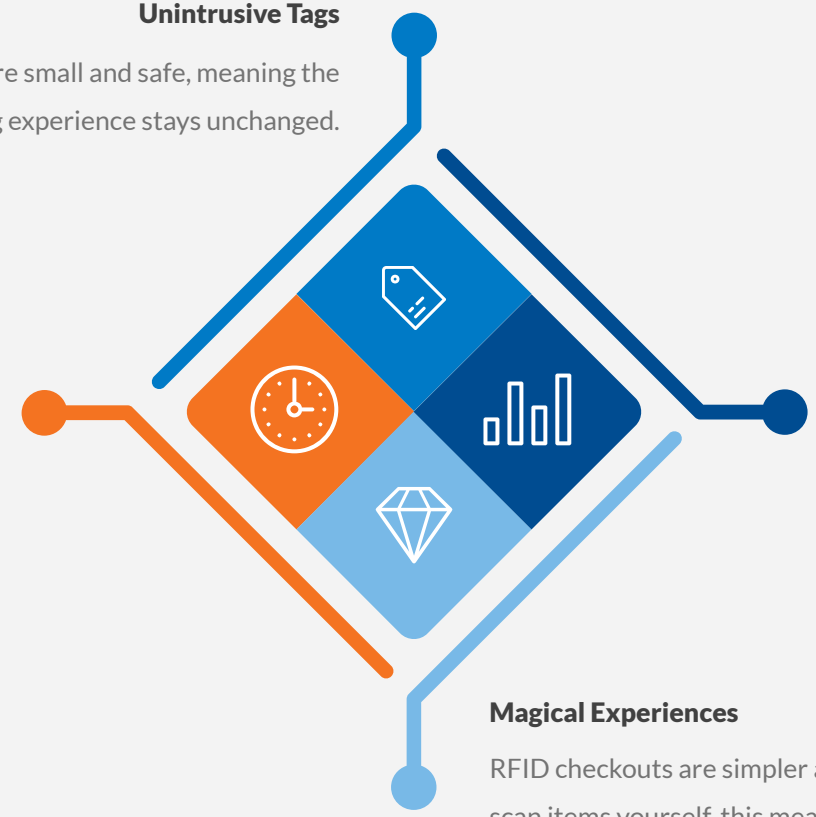
Customer Experience

Unintrusive Tags

RFID tags are small and safe, meaning the browsing experience stays unchanged.

Time Savings

Increasing the speed of checkouts eliminates waiting in slow lines, which has been proven to drive away customers and lead to friction.



Increased Value for Customers

Fast-Tag gives customers back more time to spend with loved-ones, and live a calmer life in an increasingly time-starved world by improving their shopping efficiency.

Magical Experiences

RFID checkouts are simpler as they reduce the need to scan items yourself, this means people only need to spend time paying. Automatic scanning has been described by many people as magical.

Implementing RFID technology

Basket Checkout Model

In supercentres, baskets account for **52%** of customers, and sometime account for **81%** in other Walmart stores (like discount), so they are the **primary attention** in implementing RFID.

Basket self-checkout concept
(learn more here)

01

Customers Shop As Usual

Customers shop exactly as they otherwise would, but they arrive at checkout and see no lines

02

Items Are Scanned

Their baskets or loose items are placed inside the scanner and and all products within the basket are scanned in seconds, skipping the lengthiest part of current checkouts

03

Customers Purchase the Products

Customers can purchase their products using a similar interface to current self-checkouts, using either cash, card or methods like mobile

04

Customers Leave

Customers take their basket and go, happy to have avoided the inconvenience of current checkout options

> *I'd love that solution!*

Stephanie

Implementing RFID technology

Cart Checkout Model

Cart self-checkout concept
(learn more here)

78% Carts account for **48%** of customers, but **78%** of sales, especially in supercentre where people buy more per trip. This is where you would install cart checkouts.

Our solution supports cart scanning in two steps:

1. Customers put their carts into the bay. All the items in their cart are scanned at the same time and appear on the checkout console.
2. Customers pay and the gates open, allowing them to push their cart through and leave the store.

Showcase: FUJITSU

In 2019, Fujitsu, an innovative technology company working with checkouts, showcased a new RFID checkout called the U-Scan Mini-Express RFID. This product works similar to how we envisioned our basket self-checkouts. They have also shown interest in the development of cart checkouts. You can learn more about their work here, and we recommend a partnership with them while developing Walmart's checkout solutions.

Implementation

Produce

Due to produce being small, loose and low cost, we thought of innovative ways of incorporating it into an RFID-enabled stores.
We propose two primary solutions to this issue, more can be read about them in the document linked below.

Produce Card Station

Self-Service Scales

At the produce stalls, there are machines to weight your items. Shoppers can then tap an RFID tagged card to keep track of produce in their carts. When you check out, this card is presented and taken by checkout machines.

No Sorting Items at Checkout

Customers don't need to sort their produce to weigh it, and this option wastes less RFID chips because the cards are reused thousands of times in a store.

Potential for Lines

Without very careful planning, these counters could become a source of slow lines. The loss of these cards can be an issue and attention needs to be brought to the user experience to ensure the scales follow our vision of a simple experience.

Self-Service Scale Render
(more in document linked below)

Packaging Produce

Biodegradable Bags, Grouping Produce Together

Similar to how companies like Costco have approached bagging, transition from offering loose produce to pre-packaged bags or cartons of produce, attaching RFID labels to those.

A Simple Solution

This solution adds the least complexity to the shopping experience, as customers don't need to spend time weighing their own produce.

Less Personal Choice

The main drawbacks of this option is that people aren't able to select the exact produce they want, and can be forced to buy more than they might want or need, leading to potential food waste.

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Implementation

Labelling Items

In our solution, RFID tags are added to all products, except produce, in order to identify them at checkout. This is already being implemented in the apparel industry and can be easily applied to most products sold at Walmart.

While there are multiple approaches to labelling items, we recommend Walmart require large suppliers to add the tags at the point of manufacturing, while having associates add the tags for smaller suppliers to preserve product diversity. More can be read about these solutions and others in the document linked below.

Tagging during manufacturing

Large suppliers (ex. over 1 million products sold per year) add RFID tags during manufacturing, putting the financial burden on suppliers.

Tagging during stocking

Small suppliers have their tags added by associates during stocking, the price from their tag is taken as part of the supplying agreement.

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Implementation

Educating Customers

The importance of educating customers

Customer education is incredibly important of the integration of new technology into a retail environment. Walmart has a history of transparency when it comes to innovation: "**We chose right from the very start to not hide the technology,**" Mike Hanrahan stated on the IRL prototype store's cameras and AI systems.

1. As RFID is integrated into all products in the Walmart store, it will be crucial to educate consumers on how they can interact with the tech, while also providing them with information on any concerns that may rise.

2. Our solution proposes a combination of pamphlets (as viewed on the left), posters, and other educational tools (like screens) in order to keep the customers informed.

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Evaluation of our solution

Impact

RFID Checkouts

Time Savings

Since the slowest part of an RFID checkout is payment, we can expect times of **a minute,** similar to other retailers like Decathlon, but shorter than competitors.

Happy Customers

This solution will help **227M** Walmart customers in the US and Canada live more stress-free and shop faster while removing the major checkout pain point.

Drive Change

The sheer number of tags that Walmart will be ordering will **drive innovation** in the industry and reduce tag prices to a **tenth of a cent**.

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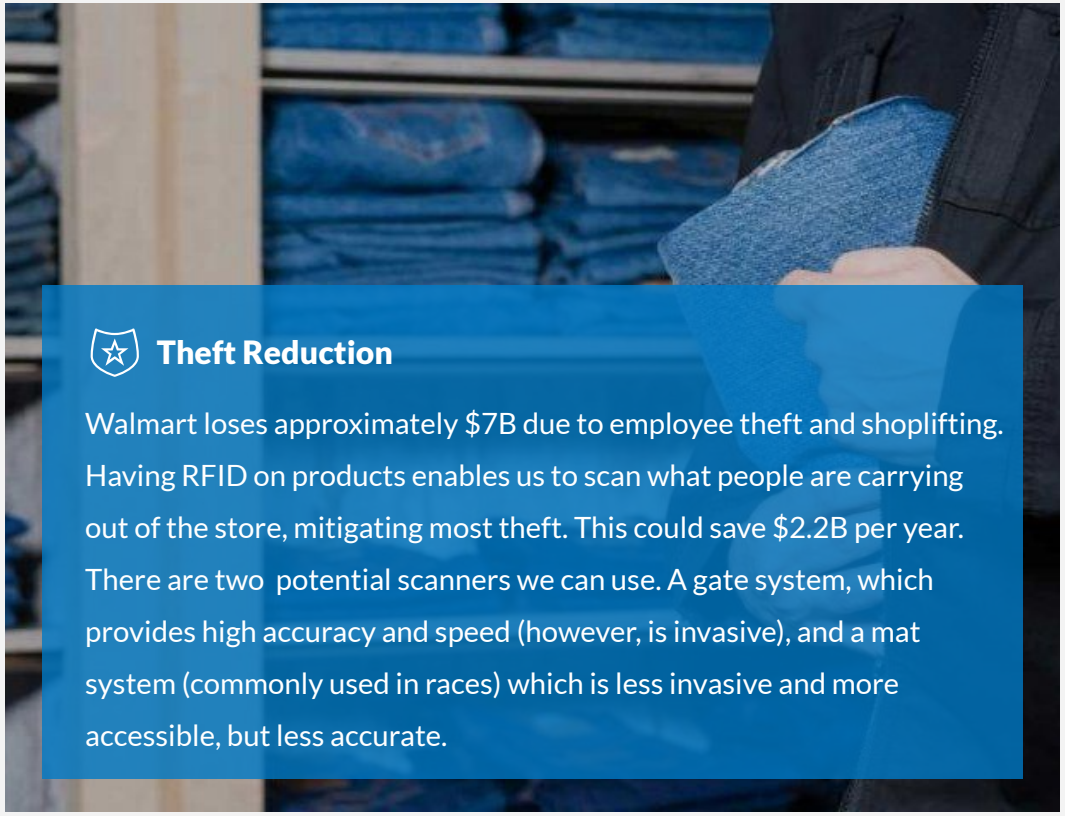
Impacts of other potential use cases of RFID

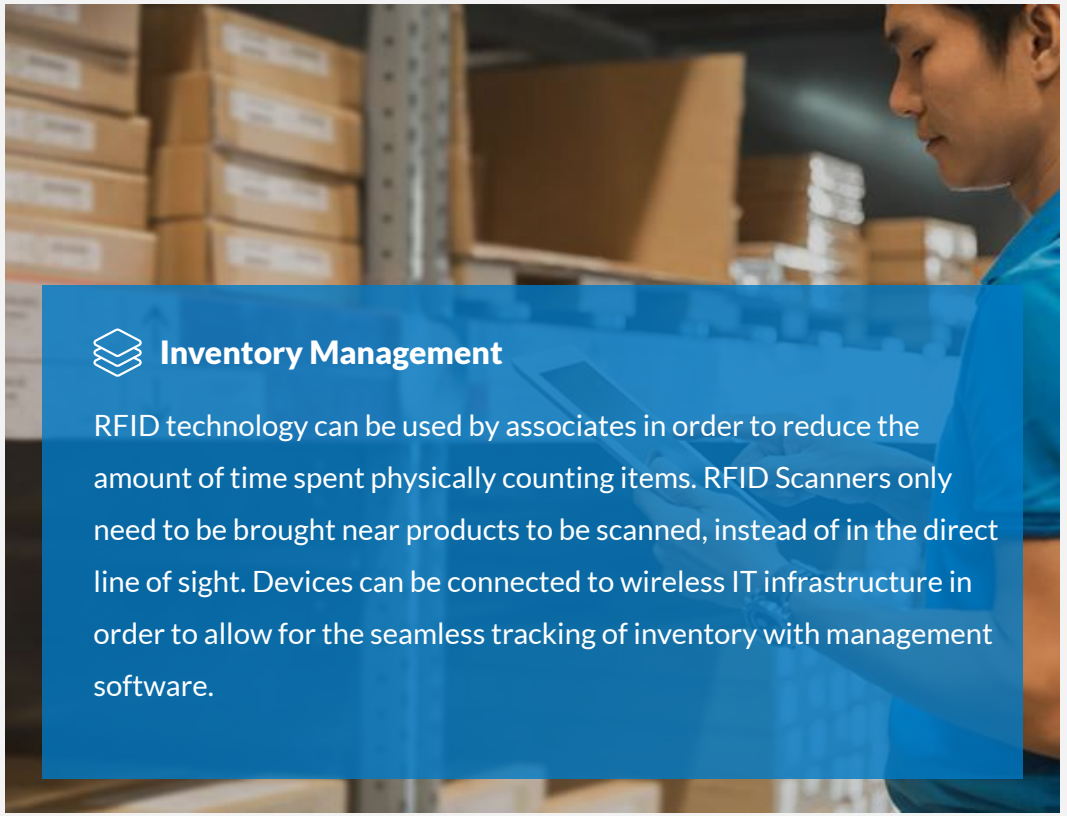
Other Uses of RFID Technology

Since RFID tags are going to be added to all products, this opens doors to other use cases to get a better return on the large investment in RFID technology. We outline two here, and more can be read about them in the document linked below.



Theft Reduction

Walmart loses approximately $7B due to employee theft and shoplifting. Having RFID on products enables us to scan what people are carrying out of the store, mitigating most theft. This could save $2.2B per year. There are two potential scanners we can use. A gate system, which provides high accuracy and speed (however, is invasive), and a mat system (commonly used in races) which is less invasive and more accessible, but less accurate.



Inventory Management

RFID technology can be used by associates in order to reduce the amount of time spent physically counting items. RFID Scanners only need to be brought near products to be scanned, instead of in the direct line of sight. Devices can be connected to wireless IT infrastructure in order to allow for the seamless tracking of inventory with management software.

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Validation

Case Studies

1 - Decathlon

Innovative french sporting goods retailer

RFID since 2013

Since 2013, they have been putting RFID tags onto their first-party products at the point of manufacturing. They partnered with **Tageos** to develop tags suited to their use case.

Used in All Steps of the Chain

RFID is present in all parts of the commerce chain: from manufacturing to shipping and to retail stores. The tech is fully deployed in more than **900** of its stores where it is used for checkouts, inventory management and theft reduction.

Fantastic Results

Using RFID technology in-stores has led to **1 minute checkouts**, **5x** increase in inventory counting speed as well as reduced labor costs and losses of sales.

[RFID] has been a game changer for us.

Herve D'Halluin

Leader of RFID Division
@ Decathlon

2 - Libraries

Bringing technology to books

Gradual Rollout Around the World

RFID has been rolling out in libraries around the world, from the US to India, for the last 10 years.

More Efficient Libraries

These tags give customers access to faster and easier checkout and check-in. It has also led to higher inventory tracking accuracy and better satisfaction in staff.

Increased Human Interaction

RFID has been attributed to increased interactions between customers and librarians, who spend less time on routine and mundane tasks and are able to help customers with their research.

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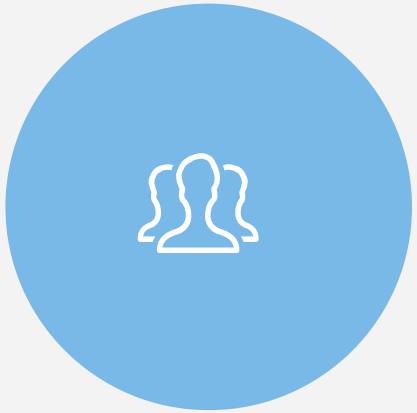
How will employees be affected?

Impacts on Associates

Associates are at the heart of any Walmart location. They add the human touch and make Walmart a comforting place to be, as opposed to a warehouse. Whenever we implement new innovations, it's important to keep associates in mind.



No job loss

Compared to self-checkout

Fast-Tag checkouts displace associates at a similar rate to self-checkouts.

Retraining

For displaced associates

Associates can be retrained to help with self-checkout and improve customer experience.

Fulfilling work

Replaces mundane tasks

Our solution replaces mundane tasks with more challenging and fulfilling work.

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Plan for implementation

Implementation Timeline

2023 — Research & Development

- In-depth research into industry, selecting partners to develop and supply technology.
- Begin private testing of scanning and labelling

2024-2025 — Begin Implementation

- Take advantage of handheld scanners to increase inventory accuracy and for online deliveries
- Start testing RFID self-checkouts at **select test-stores** with non-produce items
  - A **50-50** self-checkout to normal checkout split
  - **Collect data** on customer experience
- Run **ad campaigns** to inform the public on the advantages of the new tech and gauge public perception
- Develop produce solutions

2026 — Deployment of Produce

- Deploy **produce solutions** as well as RFID self-checkouts to a larger group of stores and keep evaluating customer feedback
- Prices for labels will keep dropping

2027-2028 — Increased Roll-outs

- As RFID technology improves, begin developing checkout-less walkthrough solutions
- Keep rolling out self-checkouts to more stores around the US and Canada
- Continue increasing the proportion of self-checkouts to normal checkouts
- As legislation or technology evolves, remove self-checkouts for edge cases like alcohol and tobacco

2028+ — Global Implementation

- Roll out self-checkouts to all stores around the world
- Commit to 100% self checkout adoption

Looking into the future

Future Opportunities

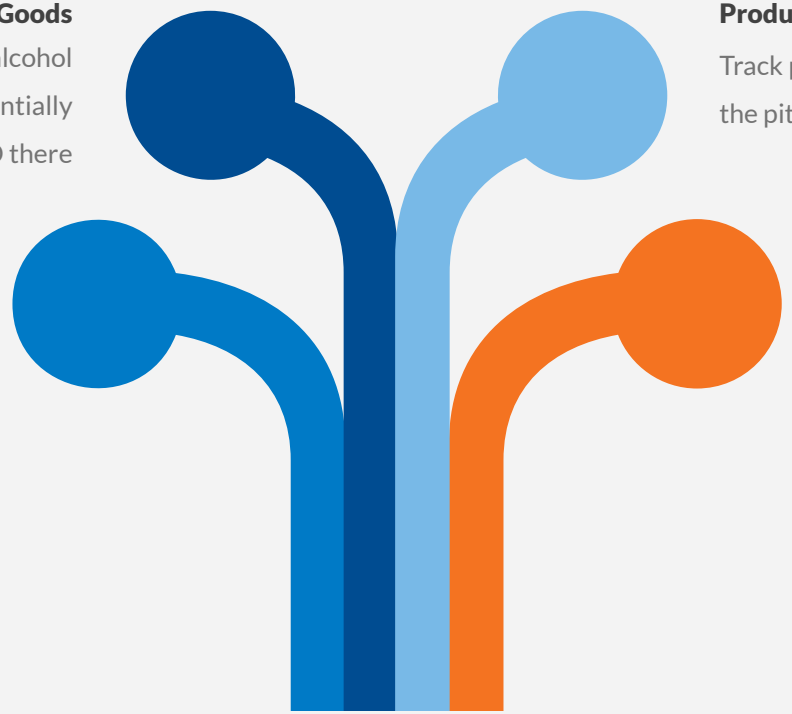
As technology and legislation evolve, opportunities to improve the checkout experience will arise.

Restricted Goods

If legislation allows it, purchases with restricted goods like alcohol and tobacco could be included in fast-checkouts, by potentially getting associates to go to checkouts and check ID there

Walkthrough Checkouts

Similar to how Amazon Go stores work, scan people's purchases in baskets and containers as they walk through gates, and automatically pay for it, leading to zero friction



Produce Labelling

Track produce individually while avoiding the pitfalls of current technology

Future Revisions of RFID Technology

Innovations in digital identification labelling could lead to new version of RFID or other standards allowing for better accuracy, speed and range

FAQ

Any Questions?

What do RFID **tags store**?

RFID

Do people need to **bag** their purchases?

Bagging

How **expensive** might this be?

Expenses

Is RFID **safe**?

Safety

What happens to **normal checkouts**?

Checkouts

How **sustainable** is this?

Sustainability

What will the **produce cards** be like?

Produce Cards

Known **issues**

Issues

What types of **checkouts** are the most **adapted**?

Adapted Checkouts

Recommendation Hub with Further Reading, **Visualization Explanations** and Sources

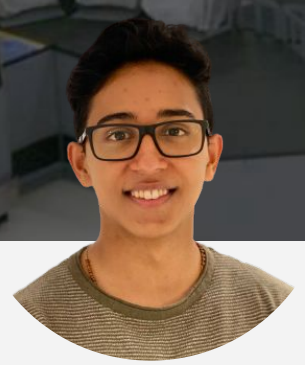
Recommendation Hub

Thank you Walmart!

We took on this project with little knowledge of the retail industry, and have learned so much over the past four weeks. We're so excited about the future this technology has the potential to bring. If you have any questions, don't hesitate to reach out. Thank you so much for the opportunity, and we hope you found our recommendation valuable!

Alexander Aumais

Project Manager & Research Lead



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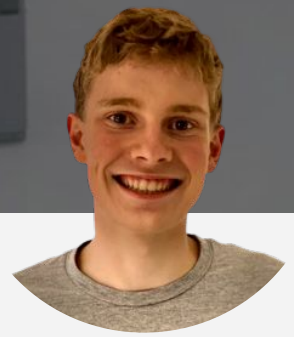

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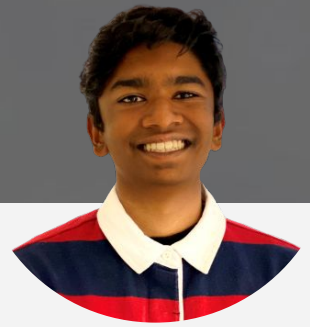

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