

# Ethical Evaluation of Amazon Go: Navigating Retail Innovation through Ethical Principles

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## **Abstract**

As reliance on Artificial Intelligence in the retail sector grows, ethical concerns multiply for both providers and consumers. This report deeply analyzes Amazon Go , which employs a combination of deep learning, computer vision, and sensor fusion in retail, emphasizing ethical principles and responsible implementation using SUM values and Fast Track principles. The analysis aims to portray Amazon Go's impact on operational effectiveness, ethics, and adherence to privacy and governance standards. The research findings will guide Amazon Go's redevelopment in line with responsible AI through the PBG framework, covering the AI development lifecycle. It is crucial to note the report's concise overview acts as a catalyst for further research.

Keywords: Amazon Go, Computer vision, AI technologies, Ethical principles.

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# 1 Introduction

In an era characterized by rapid technological advancements, the retail industry stands at the forefront of embracing innovative solutions to enhance efficiency, customer experience, and overall business performance (Choudhury, Phatak, and Joshi 2023). The integration of Artificial Intelligence, encompassing machine learning, deep learning, computer vision, speech recognition, and natural language processing, has reshaped the industry's operational landscape (Russell and Norvig 2010). Notably, this adoption, exemplified by retail giants like Amazon Go, marks a transformative shift, presenting unparalleled opportunities to revolutionize the shopping experience, introducing a new era of convenience and efficiency (Akshaya and Krishnan 2023). However, there has also been some ethical concerns about the use of Artificial intelligence in this industry.

This assessment delves into Amazon Go, examining the fundamental Sum values and Fast Track principles guiding responsible AI implementation. It further explores the ethical dimensions and introduces a Process-Based Governance (PBG) framework, strategically crafted for Amazon Go's redevelopment, covering the entire AI development lifecycle.

The scope of this research is carefully defined, with the goal of providing an in-depth analysis of ethical issues and the AI development process that is unique to Amazon Go. As the discussion moves forward, the paper aims to provide light on the technological intricacies and ethical concerns present in Amazon Go. It provides a critical assessment and acts as a foundation for more investigation into the developing field of responsible AI implementation in the retail industry.

## 2 Background

Considered as “a new kind of store with no checkout required” (Tillman 2020), Amazon originally opened an Amazon Go location as a beta to its employees in late 2016 in its home market of Seattle. The store opened to the general public in January 2018. It debuted the initial Amazon Go store as a checkout-free retail concept, eliminating registers and cashiers. Customers utilize the ‘just walk out’ shopping experience by selecting items, and with the Amazon Go app, they seamlessly exit the store, linking the app to their Amazon account for automated billing (Picaro 2023).

The integration of artificial intelligence by Amazon Go revolutionises the retail industry by improving automated checkout, permitting extensive data gathering, and upending conventional in-person shopping and labour structures. With the removal of physical checkouts and staff members, Customers adjust to the system ,experiencing a shift in mental, physical, and emotional engagement with minimal access to human staff (Gulson, Murphie, and Witzenberger 2021).

Amazon Go leverages advanced technologies such as computer vision, deep learning, and sensor fusion to track customer movements and purchases in real-time. Customers must download the Amazon Go app, have a smartphone, and register an Amazon account before they can make purchases at an Amazon Go store. After doing these things, the consumer enters the physical shop by scanning the Amazon Go app on their smartphone. The user may now browse the store, add and remove products from their virtual cart, and move around

With Amazon’s ”Just Walk Out” AI technology, you may use your Amazon app or a connected payment method to avoid the typical checkout process. Products you take from the shelf while shopping are instantly placed to your virtual basket. When you leave, you are only charged for the products you actually take, and charges are made to your associated credit card or Amazon account (Amazon 2017).

Following its debut to the public, customers were captivated, leading to a surge in visits and the creation of exceptional customer experiences. Amazon Go garnered the label ”the future of grocery shopping,” with encounters being characterized as nothing short of magical. The consensus formed around Amazon Go potentially revolutionizing the landscape of physical retail.. Remarkably, most Amazon Go stores received outstanding ratings on platforms like Yelp, averaging between 4 to 5 stars, and even in the Apple app store,



Figure 1: Surveillance Cameras Employed in an Amazon Go Store (Coldewey 2018)

it boasts a remarkable 4.5-star rating, surpassing the rating of Amazon’s flagship shopping app (Cheng 2019).

Although, Details regarding their technical innovations are unknown, but it shows that Amazon is adopting a camera-centric approach. It is predicted that these cameras would keep an eye on both product placement and the people engaging in shopping activities (Swanson 2016).

### 3 AI Assessment

Ethical principles in Artificial intelligence involves evaluating artificial intelligence systems and applications based on established ethical standards and guidelines. Our focus being Amazon Go will be evaluated in this section, using

the recognised ethical standards, such as Sum values and Fast Track Principles to identify possible biases, prejudice, and unintended outcomes that may result from AI algorithms and implementations.

Finally based on the findings from our assessment, a PBG (Process Based Governance) Framework will be designed and explained in alignment with responsible AI implementation.

### **3.1 Sum Values**

Ethics in artificial intelligence (AI) has become a pressing concern as technology continues to advance. In order to ensure that AI systems are developed and used responsibly, it is crucial to consider the sum values that underpin ethical decision-making. These values include Respect, Connect, Protect and Care.

#### **3.1.1 Respect**

Respect refers to the ethical principle of treating individuals with dignity, recognizing their rights, and acknowledging their perspectives and values.

- Amazon Go's cashierless model is designed to provide a more streamlined and efficient shopping experience. By minimizing the time customers spend in the store, the technology respects the value of individuals' time and enhances convenience, contributing to a more dignified shopping process.
- The technology empowers users by allowing them to shop independently without the need for traditional checkouts. This respects the autonomy of individuals, giving them the freedom to choose how they navigate and complete their shopping, aligning with principles of dignity.

#### **3.1.2 Connect**

Connect refers to the ethical precept of encouraging positive connections and relationships. It highlights how crucial it is to establish and preserve significant relationships and interactions between people, communities, and technology.

Amazon Go fosters a more efficient and streamlined shopping experience, connecting with users who value convenience. Although there might not be cashiers, There are staff members put in place by Amazon Go to help with the app, answer questions, and take returns, demonstrates a commitment to connecting with consumers on a personal level. This human interaction and support contribute to a positive and helpful customer experience (Coldewey 2018).

However, there are concerns about the locations of these stores as consumers expressed difficulties related to the inaccessibility of the Amazon Go store (Suk et al. 2022). There are limited number of Amazon Go stores, individuals residing in other areas may find it challenging to access them.

### **3.1.3 Protect**

Protect in ethical principles involves evaluating the measures in place to ensure the safety, security, and well-being of individuals.

- Amazon Go’s commitment to providing an inclusive shopping experience aligns with social values by catering to a diverse range of users. The presence of an ID checker in the wine and beer section of these stores indicate a commitment by Amazon Go to protecting consumers by ensuring compliance with age restrictions. This staff member plays a role in safeguarding the well-being and legal adherence of customers (Coldewey 2018).

### **3.1.4 Care**

The ethical principle of Care within the context of SUM values involves evaluating the impact of its cashierless model on the well-being and welfare of individuals and communities:

- Amazon Go’s cashierless model aims to save customers time and reduce stress associated with traditional checkouts, demonstrating consideration for users’ well-being
- Amazon Go demonstrates a consideration for user needs and well-being. The technology aims to make the shopping process smoother and more enjoyable.



## **3.2 Fast Track Principles**

The term "fast track principles" in artificial intelligence refers to the set of guidelines and practices designed to quicken the advancement and use of AI technology. These guidelines are intended to guarantee that AI systems be created in an ethical, responsible, and human-centered manner. They include: Fairness, Accountability, Sustainability and Transparency. These would be assessed in the following subsections.

### **3.2.1 Fairness**

Fairness refers to the ethical and just treatment of individuals and groups in the development and deployment of artificial intelligence systems. The concept of fairness addresses concerns related to biased outcomes, discrimination, and the equitable distribution of benefits and harms.

Amazon Go's cashierless model, which originally relied on purchases made through an app connected to a bank or credit card, raised concerns of exclusion for individuals without access to smartphones, credit cards or traditional banking services, known as the "unbanked" (Catherine 2021). The use of a digital payment system led to concerns of discrimination and elitism (Kim 2019).

### **3.2.2 Accountability**

The ethical obligations placed on people, institutions, and systems engaged in the creation and application of artificial intelligence are referred to as accountability. Accountability makes ensuring that the effects of AI technology are tracked, assessed, and dealt with, and that those in charge are held accountable for their actions.

The fact that Steve Kessel, Amazon's senior vice president of physical stores, addressed concerns about discrimination and elitism in an internal all-hands meeting indicates a level of accountability. Acknowledging these concerns publicly is a step toward transparency and responsibility (Kim 2019).

### **3.2.3 Sustainability**

Sustainability is known as the ethical and responsible application of artificial intelligence technology with an emphasis on long-term social, economic, and environmental concerns. The concept of sustainability in artificial intelligence

highlights the necessity of creating and implementing AI systems that not only help society and the environment now, but also in the future.

In Amazon Go stores, If a camera encounters problems, the system doesn't break down entirely. A system that can continue to function even when individual components face issues reflects a sustainable approach. It reduces the likelihood of disruptions, leading to more reliable and consistent service for users. Also, the Amazon Go system has been tested with cameras missing, and a replacement is promptly put in place, which demonstrates an efficient problem-resolution mechanism (Coldewey 2018)

### **3.2.4 Transparency**

Transparency is the Openness and clarity in the creation, maintenance, and implementation of artificial intelligence systems. Transparency entails giving users, developers, and the general public clear, accessible, and pertinent information regarding AI decision-making, procedures, and results. The Amazon Go system is transparent in its operation, utilizing a network of cameras and sensors. The openness of the technology is intended to create a seamless and transparent shopping experience.

Amazon's 2014 patent reveals a system that employs algorithms to analyze customer gestures captured by cameras, utilizing weight sensors to monitor items leaving the shelves, effectively subjecting shoppers to constant surveillance, tracking their movements and collecting a wide range of personal and physical data, raising significant concerns.

Transparency requires clear communication about the types of data collected especially when it involves personal and physical data, how it's used, and the implications for users.

## **3.3 Process Based Governance Framework (PBG)**

The process-based governance framework ensures ethical AI development and deployment through guidelines and policies. Governing the entire AI lifecycle, it aims to mitigate risks and align systems with ethical principles for responsible implementation. Subsections below detail how Amazon Go can align with responsible AI implementation.

### 3.3.1 Problem Evaluation

The problem Amazon Go is trying to solve is to enhance the convenience of the shopping process by saving customers' time and energy. Amazon Go envisioned a corner store where registered customers could enter, select items, and exit without the need to wait in line. The issue is the exclusivity of the "unbanked" as earlier mentioned. To ensure that the system upholds the ethical principle of fairness, Amazon go can:

- Introduce cash payment options for customers who are unbanked, allowing them to participate in the Amazon Go shopping experience without the need for digital transactions.
- Implement a membership card system that allows customers without access to mobile banking to use physical cards to enter the store and complete transactions.
- Explore partnerships with alternative digital channels that cater to the unbanked population, such as mobile payment services that do not require traditional bank accounts.

### 3.3.2 Data Extraction & Acquisition

Amazon Go's foundation for data extraction revolves around its customers. The system is continuously collecting data on customer preferences and actions in connection to items, in addition to information about inventory and processes (Lee 2018). For Amazon to become ethical in this stage of development, it needs to:

- Obtain clear and informed consent from customers before collecting their data. Clearly communicate the extent of data collection and surveillance to customers through signage, terms of service, or a privacy policy (Elnahla 2019).
- Be transparent about the data collection process. Clearly communicate what data is being collected, how it will be used, and who will have access to it. This allays the fears of customers who perceive Amazon Go as a potential encroachment on personal privacy and freedom (Timmermans 2018).

### 3.3.3 Data Preprocessing

This is the stage where raw data collected from various sources is prepared and transformed to meet the requirements for subsequent stages of the AI development process. For Amazon Go to be Responsible and Ethical:

- Prioritize the anonymization of personally identifiable information (PII) during the data cleaning process (Crow and Wiles 2008). Aggregating data at a higher level can help protect individual privacy while still extracting valuable insights.
- Be transparent about the measures taken to address biases, ensuring that the system does not favor specific demographics or perpetuate discriminatory outcomes.
- Provide users with control over their data. Allow them to access, correct, or delete their information if they choose to do so.
- Specify the algorithms and methods employed during data preprocessing. Provide references to relevant literature or standards to support the chosen techniques. This ensures transparency.

### 3.3.4 Modeling, Testing & validation

This refers to a phase in the AI development lifecycle where the trained machine learning models undergo rigorous evaluation to ensure their reliability, fairness, and effectiveness. This phase is crucial for identifying and addressing potential bias. For Amazon Go to be ethical in the modeling, Testing and validation:

- Select representative, ethically sound data for model training by ensuring relevance, high quality, diversity, and sufficient quantity. Preprocess the data as needed, addressing errors and annotations, to optimize model performance and alignment with the intended problem domain (Rhem 2023).
- To ensure ethical alignment during the modeling, testing, and validation stages at Amazon Go, incorporate diverse teams representing various dimensions, including ethnicity, gender, socioeconomic status, and educational background. This inclusive approach facilitates the identification and elimination of potential biases, ensuring that the algorithm is developed with a comprehensive range of perspectives (Yaqoob 2023).

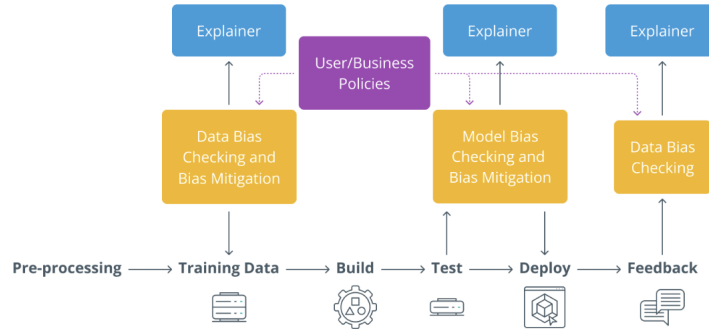


Figure 2: Addressing Bias Throughout the AI Lifecycle (Yaqoob 2023)

### 3.3.5 Deploy, Monitor & Re-assess

Amazon Go can actualize responsible AI implementation by deploying the trained machine learning model into real-world environments, continuously monitoring its performance, and periodically reassessing to ensure sustained ethical and effective utilization. Steps taken should be to:

- Implement ethical deployment practices to ensure that the model's impact aligns with ethical guidelines. This includes considering potential biases, privacy concerns, and the overall impact on end-users.
- Continue to prioritize and uphold privacy standards. Regularly review and update data handling practices to safeguard user privacy.
- Actively seeking input from end-users, such as through explicit feedback channels or social media, allows for the identification of potential ethical concerns or areas for improvement in user preferences and experiences. Implicit feedback, like clicks or purchase actions, further contributes to understanding user preferences, emphasizing the importance of responsible and ethical practices in handling such data (Smith 2017).

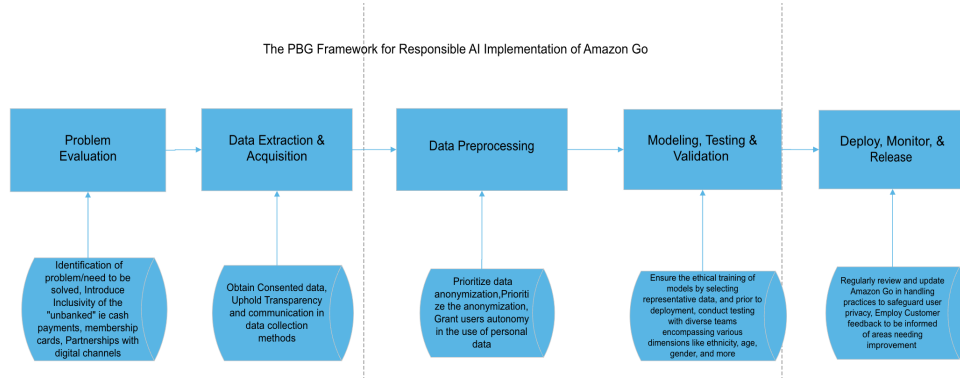


Figure 3: The PBG Framework for Responsible Implementation of Amazon Go

## 4 Conclusion

In conclusion, the exhaustive evaluation of Amazon Go, anchored in the SUM values (Protect, Care, Respect, Connect) and Fast Track Principles (Fairness, Accountability, Sustainability, Transparency), underscores Amazon Go's laudable dedication to enhancing the customer experience through time-saving measures, stress reduction, and the promotion of autonomy demonstrating a human-centered approach to AI technology. However, this scrutiny has also illuminated ethical considerations linked with AI technologies. The devised PBG framework serves as a systematic roadmap, guiding Amazon Go towards aligning its operations with responsible AI practices. This will position Amazon Go as a trailblazer in championing responsible and ethical AI practices within the retail industry. The identified key points not only celebrate achievements but also underscore the ongoing need for in-depth exploration and vigilance regarding the ethical dimensions of AI implementations in retail. Future research could delve into the evolving landscape of ethical considerations, further refining strategies for responsible AI integration in the retail sector.

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