

# Case Study: AI Ethics in Warehouse Technology Upgrades

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## Introduction

Everyone faces ethical dilemmas at one time or another, but in today's world, Artificial Intelligence brings forth a new set of challenges that deserve a concerted effort in studying. Before jumping into the deep and daunting task of studying AI Ethics, it is best to define AI Ethics to ensure proper communication and understanding. Here are three examples of others who have tried to define for us:

“Ethics is a set of moral principles which help us discern between right and wrong. AI ethics is a multidisciplinary field that studies how to optimize AI's beneficial impact while reducing risks and adverse outcomes.” – IBM [1]

“The ethics of artificial intelligence covers a broad range of topics within the field that are considered to have particular ethical stakes. This includes algorithmic biases, fairness, automated decision-making, accountability, privacy, and regulation.” – Wikipedia [2]

Meta, much like IBM and Microsoft, follows five pillars for ethical use of AI: 1) Privacy and security, 2) Fairness and inclusion (Microsoft lists these two separately), 3) Robustness and safety, 4) Transparency and control, and 5) Accountability and governance [3].

The topic of the ethical use of AI is a hot topic in public discourse, but who stands to win or lose if AI is not employed ethically? Take a moment to reflect on your own ideas of AI and what other people or entities come to mind before answering the first discussion question.

### Discussion Question #1:

A stakeholder is someone who will be affected by AI regardless of whether they own it, use it, or are affected by second and third order effects. Some stakeholders are everyday people who do not even know that an AI impacted their day. Each stakeholder brings requirements for AI to exist and to be used. Who are the stakeholders in the use of AI? How do they win or lose with any outcome or issue presented?

Example AI Stakeholders: academia, government agencies (National Science and Technology Council (NSTC)), intergovernmental agencies (United Nations (UNESCO), World Bank), non-profit organizations (Ethics and Governance of AI Initiative, Black in AI, Queer in AI, Women in AI Ethics, Future of Life Institute), private sector companies (Google, Meta, IBM, Microsoft, etc.), other end-users and potentially non-users.

## Discussion Question #2:

Popular examples of AI include ChatGPT, Lensa, and social media image and video generators. Where is the data coming from to feed the AI so it can create? How biased is the source data? What are the alternatives to not using the AI program? What are the payoffs? Who does it hurt?

Some examples of AI bias that has affected others: resume evaluation tools [4], teacher evaluations resulting in firing [5], uneven parole evaluation scoring [5], and “digital redlining” of minority neighborhoods in online review and direction websites [6].

## The Scenario

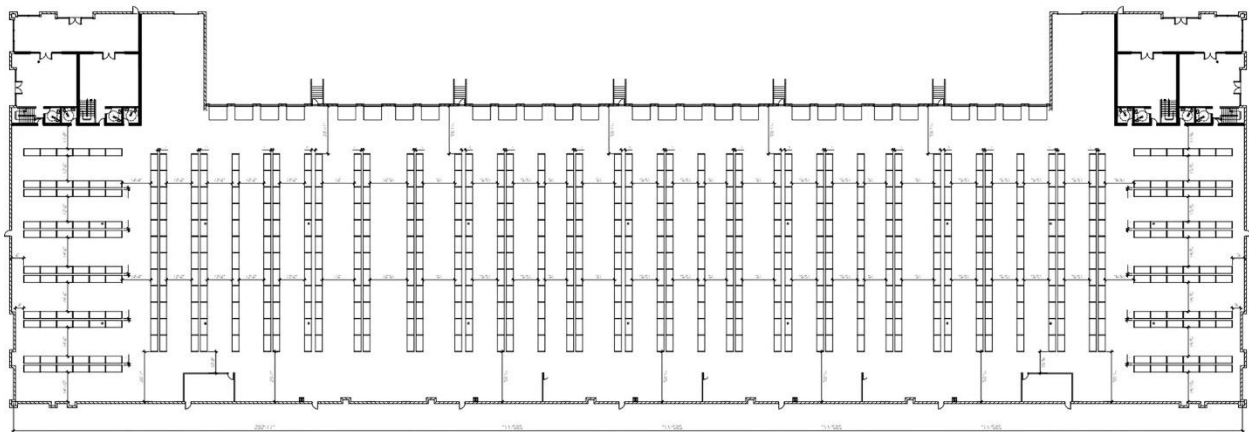


Figure 1-Factory Layout 1000' x 330' (not necessarily to scale)

A **non-tech enabled warehouse** that supplies parts for many home appliances has problems finding task qualified **workers** within their facility in a timely manner as many of their workers are needed in multiple locations in a 300,000+ sq ft warehouse and logistics facility. Arrival shipments sometimes arrive without warning or are within very broadly announced time windows with poor or no communication between the **driver** and the **receiving department**. **Truck drivers** are not paid by the hour and become difficult to work with the longer they have to wait – sometimes the delays also result in contract breaching fees. **The receiving department** currently relies on radios and a PA system for communication with **floor managers**. The **new technology manager** for the company has been researching solutions and has discovered a **Warehouse Management AI (WMAI) System** that can monitor and track employees and equipment in a facility and communicate with employees via smart watches. Part of enabling the WMAI is to put tracking chips on all pallets, trucks, or other devices used to move inventory. Other tech upgrades under consideration include higher definition cameras for security and robotic forklifts that can unload trucks and move pallets in the warehouse. Tech upgrades come with upfront and maintenance costs but are cheaper over time when compared to current work force size when including medical, insurance, and other human costs. Costs could be reduced to lower operating costs if the number

of employees is reduced and replaced with automation. Workers refuse to wear any kind of tracking tech for fear of bathroom break surveillance stories (Amazon employee tracking) they have read about [7], and “big brother” watching every second of their day. The company has not been profitable more often than historically “normal” and new rivals in production and logistics are threatening the company’s existence. This plant is the largest provider for jobs in a small town and only requires a GED (90% of town employment for entry level employees) and pays more than minimum wage.

A **smartwatch** under consideration for this upgrade not only tracks and communicates with employees through Wi-Fi, but also monitors their steps, heart rate, oxygen intake, and will alert the system if the employee falls down or is impacted in other situations. These features are easily readable on the watch face and can be used as an incentive for healthy behaviors and ensuring employees are not overworked. In case of a suspected medical emergency (falling, strokes, heart attacks, etc.), management will be notified for verification and emergency response actions. Employees can log in to the warehouse system and see their health history.

Common pallet jacks require an employee to push and pull it along to slide under a pallet and jack or lift pallets off the floor and move them into or out of a truck or warehouse floor position.

**Automated Pallet Jacks** operate on battery power and require a “driver” to align them on a truck, but then lift themselves and navigate the warehouse once out of the truck. The WMAI takes over the pallet and directs it to floor positions in the warehouse. They are not used to lift pallets more than a few inches off the ground. When not in use, the automated pallet jacks park on their chargers.

Another alternative idea is to employ **Upgraded Camera Security** in the warehouse to allow users to zoom in and see everything in the warehouse in higher definition which could be used by management, security, or another upgrade to the current warehouse management system to use object detection, classification, and tracking through Machine Learning software.

### Discussion Question #3:

What are the costs/dangers and best/worst case scenarios of continuing to conduct business as usual as they have for the last 10-20 years?

### Discussion Question #4:

List 3-5 wants/needs that you think each stakeholder cares about. Stakeholders: warehouse workers, truck driver, managers (receiving department, floor, technology), company owners/investors, the small-town residents and government.

## Initial Testing

Benjamin Silver, the **new technology manager**, is a lifetime employee of the company and loves new gadgets as much as he loves the people he works with. With over 30 years with the company, he knows almost everyone in the warehouse and is a likeable person. Under pressure from upper

management to come up with ideas to reduce wasted resources to increase profitability of this warehouse, Ben spends some of his sizeable research budget to purchase a dozen smartwatches, four automated pallet jacks, and organizes a pilot study program to see if an AI enabled warehouse system is a feasible solution and hopefully at least an '80% solution.'

The smartwatches arrive first, and Ben is able to get the IT team to install some trial software that uses their existing Wi-Fi repeaters to enable the tracking features of the watches to fill a simple boxlike display of dots on a warehouse map. Wearer statistics and measurements are readily available while wearing the watches but is not connected to any systems yet.

Once ready, he announces at the beginning of the next morning shift that he has 12 watches available for testing and asks employees who work in the receiving section to wear them. Half of the receiving employees are as old as Ben and refuse to wear anything that will track them and are not interested in "the benefits" regardless of how much Ben explains them. Three other employees are in their 30s and are interested in getting to experience wearing a smartwatch and seeing the health features as they have never worn one before and agree although they don't promise to fully "buy-in" with the idea. The remaining three watches are given to new employees in their late teens and early 20s who love new technology, but really weren't listening to half of what "Old Ben" was talking about. They've seen smartwatches before and want to try them out. As there is at least one watch per team, Ben is counting it as an early, but small, victory for change.

After Ben has passed out the devices, the receiving manager announces that they are expecting five trucks during their shift and has decent Estimated Time of Arrivals (ETAs) for three of them and no good estimate for the other two, just a really rough estimate of sometime in the next four hours. The first truck arrives during the second hour of the shift and the receiving manager is able to notify the department managers and arrange enough people to unload the truck using the usual communication methods of radio and "seeing" employees nearby. However, the second truck arrives without warning near lunchtime and the receiving manager checks the driver and the manifest in while dropping an announcement over the radio to the managers. After several minutes of small talk with the driver, no one has shown up to unload the truck and the receiving manager leaves the office to "wrangle" someone up. One department manager replies that his group, Team 1, is on the other side of the warehouse and might be able to get there in 5-10 minutes as they are on the opposite end of the warehouse where the truck docked, the second manager and Team 2 is listed as "out to lunch", and the third manager, Team 3, has not yet responded. The receiving manager contacts the operations department where the new software is being used and can now operate similar to a dispatch office. They report back that employees of the third team seem to have been separated to assisting other functions in the warehouse as they are nowhere near each other on the map. One is in the restroom, one is outside the building nearest the employee parking lot, and another is just a few hundred feet from receiving. The remaining three watches are being used in Team 1 and the team on lunch. The operator in the new dispatch role sends a message out to the smartwatches for them to report to Receiving ASAP for a truck. Team 3's manager calls in that his radio battery had died and is on his way and shows up with the one person near Receiving and they start to unload the truck as the other smartwatch employees from Team 3 arrive from their other locations and spend the next 20 minutes unloading the truck. The truck driver is visibly irritated, makes a lot of negative comments about work ethic and poor management, and "hates coming here, because you never know if it's going to be a 20-minute stop or an hour-long ordeal."

## Results

Throughout the remainder of the next two weeks, Ben records how Receiving handles deliveries to include where all the qualified receiving personnel are at the time of first notification, when the truck physically arrived, when the offloading process started, when it was completed, and where the employees went to next. The data reveals that some employees spend a lot of time in places where work is not being done, some spend a lot of time moving about the vast warehouse in motion, and not so much at any specific area for long. Some of the employees manage to remain in specific areas for most of their day and respond quickly when a truck arrives. Ben reports this to upper management and the warehouse management team which includes the three receiving team leaders. Management reviews the smartwatch location data and the WMAI's recommendations for improved employee clustering and assignments and informs team leaders to "get a handle" on their "loose cannon" employees and monitor more frequently with less freedom. According to their initial data results, people are not moving at efficient routes or cannot respond expediently to priority changes. This results in all employees refusing to wear their watches and without mandates from upper management or support from employees. Ben's project essentially ends before it goes very far. He knows there has to be some middle ground and that the company could save money by being more efficient with their time and people, but management doesn't want to push it for fear of Unionization that has been another hot topic for the last year or two. The company is back to where they started and has not solved any problems so far while at the same time spending money on IT upgrades that are not wholly getting used and now have more distrust from their employees.

### Discussion Question #5:

Is it wrong to track employees and take notice that some spend a lot more time not at workspace? To include "long" bathroom breaks? Smoke breaks?

### Discussion Question #6:

Should management have made ALL employees wear the watch for a specific time period to test out their investment?

### Discussion Question #7:

Very few actors in this case study are specifically given names/genders. Does gender/culture/identity have any impact on any of the answers you have provided so far? Were you picturing employees as all being about the same or were they diverse? Which actors stood out from the others in your mental image?

### Discussion Question #8:

If this company does not pursue a technology upgrade, where else do you see possible workplace improvements to save this company from failing?

## Reflection and Discussion Questions

**Transparency – The Company** has stated that they will be transparent with users' data once the system has been fully implemented and so far, have allowed initial testers to see their health statistics to include their step count and heart rate throughout the day. Users have noted that they cannot see where they have been throughout the day, and they are certain other system users have been using this data to find and discuss their productivity. If the company invests in the AI system that tracks employees with smart watches, where is the data stored? What data is being recorded for each employee and is it tied to specific employees? Where can employees review their data? Can they see ALL captured data or only a subset of it?

- To what extent do you think management should be able to track users and connect “dots on the screen” with specific people? Do you feel that there is enough benefit to the company to track employee movement about their campus to reduce wasted time?
- How soon should users be able to access their data? Should they be able to access their data from home (full transparency) or workplace computers only (data privacy)?
- Does the company's claim to health safety in monitoring employee's health in real time outweigh user's rights to privacy? Is it really the company's business to see employee health data?

**Accountability – The Company** claims to be following current leading security practices and has a contract with a reputable third party to ensure data integrity and security. **The Company** has also said that the data will only be used to benefit employees and process improvement efforts. If the company is found negligent in the handling of employee data or abusing the data to the detriment of the employee experience, what should the repercussions consist of?

- Users have discussed accountability in the break room and are wondering who they can go to, should their data be leaked. Who could/should they go to for assurances that there is a process for handling this concern?
- If **The Company** uses their data in other ways not listed what are the repercussions and who holds (or could hold) **The Company** accountable?

**Research Ethics** – human activity throughout a warehouse is being studied from a humanistic approach by Ben and from an asset approach by the AI. Ben is concerned in how the employees feel about the technology and is trying to sell it as a way to save the company and is trying to make users feel comfortable and perhaps develop a middle ground should they want to make changes to how the technology is used. The AI is learning how humans behave throughout the day based on their workload, location, and vital statistics through health data. The AI then starts to build behavior routines that track and begin to predict which employees are likely to do throughout their “typical day”. If the AI system is learning from employee behavior and it is being studied by AI designers,

what disclaimers should be made to those being studied? What dangers could emerge from an AI directing employee movement around a warehouse?

- Do you think this is wrong for the AI to build profiles? Aren't people creatures of habit and will likely show their daily routines to anyone who pays attention? What are your thoughts on how this could be either a positive or negative outcome?
- What ethical concerns come to mind from either Ben's or the AI's approach to learning from this research?

**Regulation** – At this point, all known safety regulations are being followed as far as government and state regulations are concerned, however, regulations concerning workplace use of wearable devices and AI is understandably limited at the time of this writing. What aspects of this scenario do you see government oversight through regulation as appropriate? Safety regulations? Fees? Taxes? New government bodies?

- What concerns can you perceive or predict should be regulated by the government?
- What other stakeholders could provide oversight and regulatory "watchdog" services?

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## Disclaimer

This case study was inspired by a true story and is representative of warehouses around the world. Names of people and actions taken in this case study do not reflect actual people or actions taken by those involved in the source material. This case study was developed solely by the author's recollection of key details of the problem as initially presented. The generic warehouse image used is modified for this case study and not intended to represent any true-to-life entity and is only used to give students a mental image for the size and scale of the problem space. The details in this figure are not relevant to the case study.