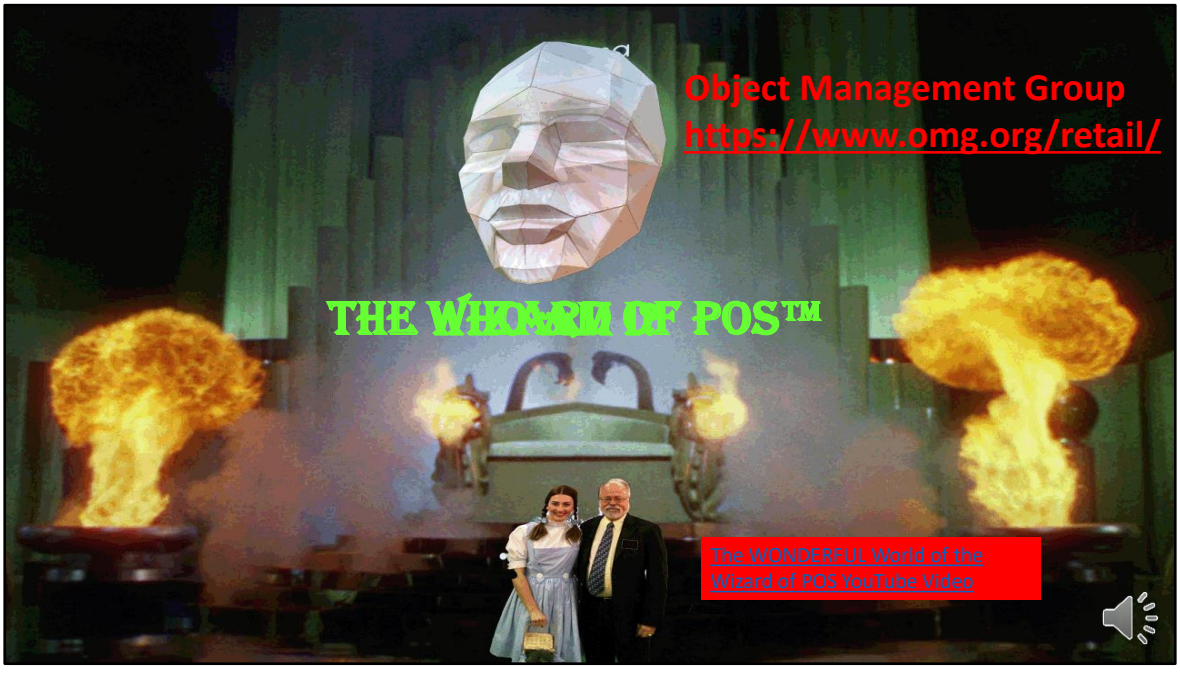
First I am quite honored because Paul Preiss and Sneha Yadamari are allowing me to share my knowledge with this impressive group.
AI is very fascinating in retail, foodservice and hospitality as AI is not new. While putting together this presentation, I became aware how pervasive AI is already in retail. It has been used for a very long time. In effect every time you use a Business Intelligence Measurement you are using a form of AI. As you will see, today AI has become quite sophisticated. Now we get to see its explosion into many other areas in retail where AI will have a significant impact.

We will get a chance to explore the relationship between AI, ML, deep learning and ultimately regressive and predictive analytics. There have been some incredible presentations today, so I'm not going into that level detail but touch into a variety of areas where AI has the potential to dramatically impact the retail world. This is just the tip of the iceberg.

Unfortunately this is going to be a highly level overview. I could take weeks to work all the way down into the details to make this work. As you will see, my iVURM model can help make this deep dive.

I started this presentation with over 150 slides and had to work hard to get down to this size. So if I go over please stop me



Who am I? My name is Richard Halter. For over 20 years I was the Chief Technology Architect for the Association for Retail Technology Standards a part of the National Retail Federation. What you about to see is part of the knowledge I absorbed from over 1450 subject matter experts. Think about this --- all that knowledge is embedded within this enormous body of work.

Today this body of work is part of the Object Management Group (OMG). This is the technology foundation of my iVURM model (more later)
(click)
Through this work, I eventually became known as the Wizard of POS

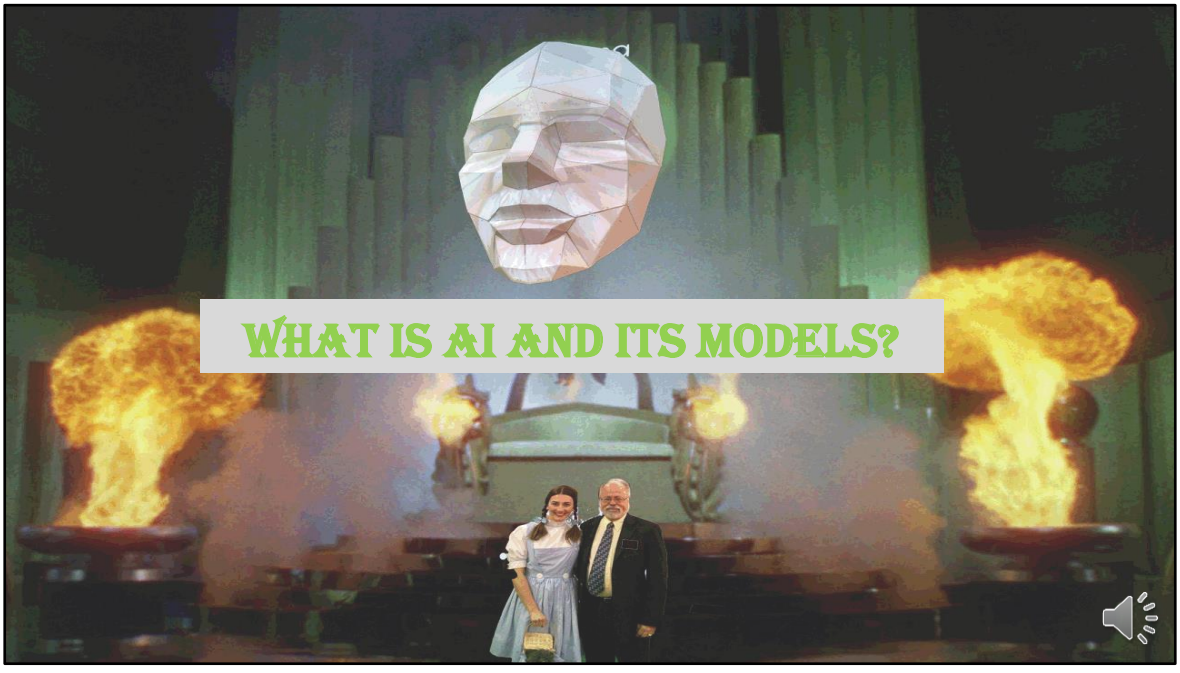
Additional Videos
These are just a sample of other videos available on the site

Strategic Failures - YouTube

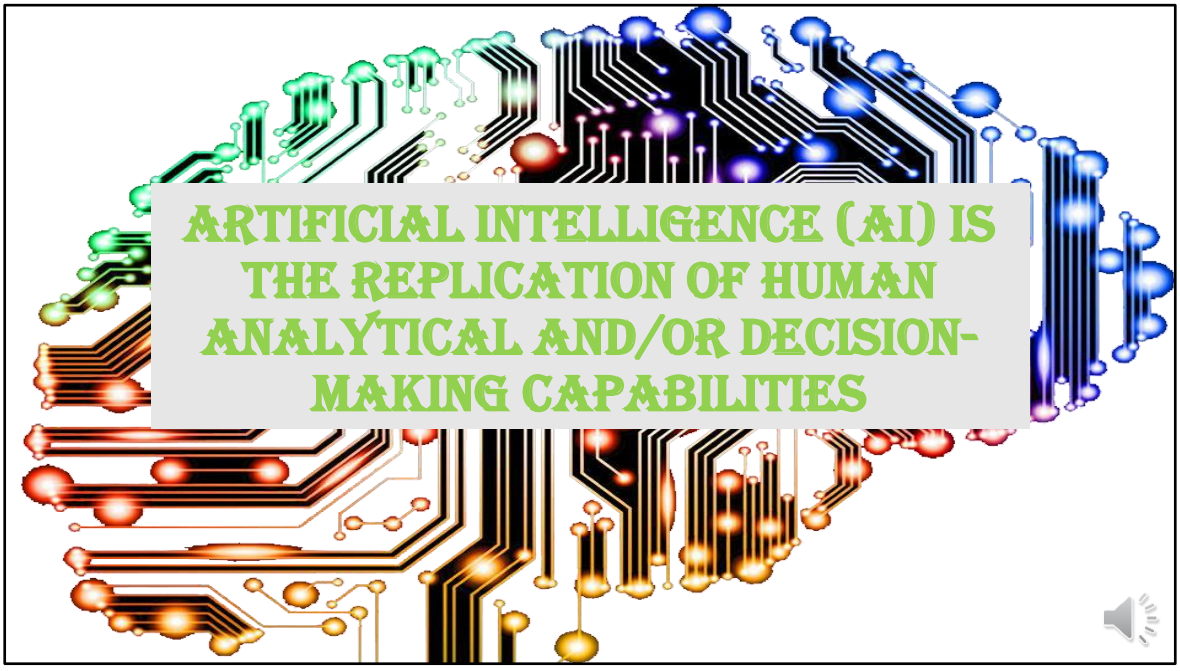
Successful Business - YouTube

What Enhancements Should I Do In 2024 - YouTube

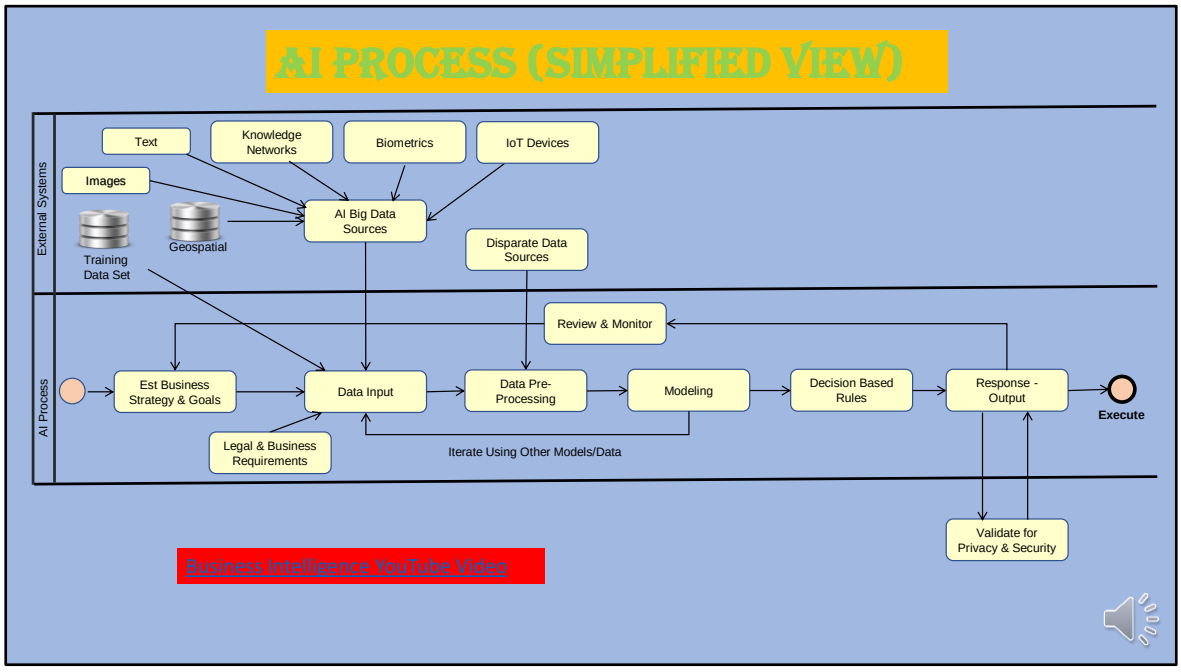
Retail Technology Integration Platform - YouTube



This may be a replication of other presentation from today but here is a quick summary targeted for this presentation



It leverages historical data and applies what is learned to current contexts to help make predictions



This is a quick overview of the AI world to help understand the context in this presentation about using AI in retail.

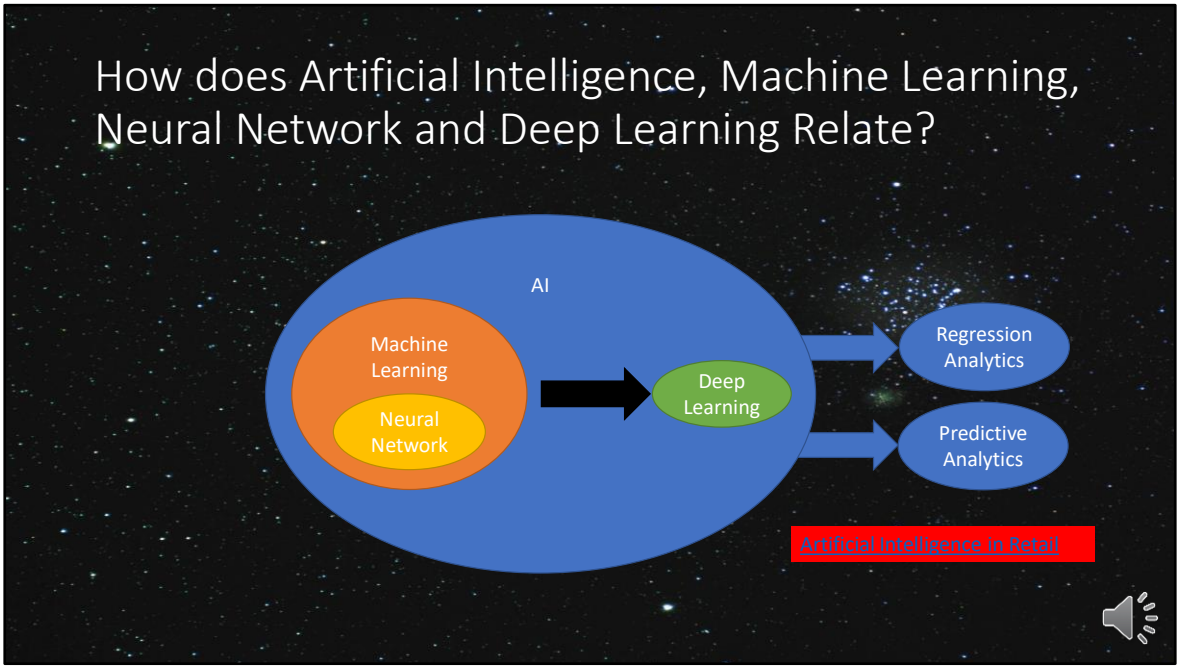
- **Business Strategy & Goals**
- **(click) Data input**. Data that is focused on strategy is the starting point for all AI. It is the fuel that feeds the AI process
    - **(click)** Start out with training data to help your AI process learn

  There can be more, this is not a complete list…
  - **(click)** Big Data – a vast amount of this data is useless – only 20% is useful in this context. The challenge is figuring out and finding that 20%
  - **(click)** Text – what people write and say can be analyzed to identify what they are talking about and the sentiments being expressed.
  - **(click)** Images – this covers photos and video. Uses various features to predict the likelihood that someone will purchase.
  - **(click)** (Social) Knowledge network data – information about people's connections and who they know. Includes the number and type of connections, as well as data about connected individuals. If all your friends are sci-fi geeks, that's probably good indication that you be one too.

- **(click)** Geospatial – people's location and movements – from smart phones, in car GPS and other mobile devices
- **(click)** Biometrics – data about blood pressure, heart rate collected from fit bands, smart watches, etc.
- **(click)** IoT Devices generated. Every day devices from televisions to coffee makers are being designed to share information between themselves and over the internet
- **(click)** Legal and Business Requirements

- **(click) Data (pre)processing**. The raw data input needs to be processed into a standard "computer friendly" format before it is ready to be used. Uses different ontology

- **(click) Modeling**. These are generated by the machine learning process using past experiences; i.e. large amounts of historic data. Iteratively apply various algorithms to generate the predictive model based on what can be inferred from the data set. This includes a feedback loop to help tailor the model
- **(click) Decision Rules** are used in conjunction with data inputs and the scores from other models to decide what to do. Sometimes these rules are derived automatically by machine learning algorithms, other times they are defined/refined by human experts/business users.
- **(click) Response/output** – at the end of the process some action needs to be taken based on the decision(s) that have been make. A prediction on its own is useless. You have to decide how to use the output
- **(click) Validate for Privacy & Security**
- **(click) Review/Monitor** Because predictive accuracy tends to decline over time due to changes in the underlying relationships, regularly access how well the model is working. Make changes accordingly.



We are exploring the relationship between AI, ML, deep learning and ultimately predictive analytics. We're not going to go into the details mathematically but rather where it can be used.

If you do a search on the internet you will find there is a real confusion on AI, ML, DL. What is what? Here is my definition for this presentation.

AI is a broad set of tools, techniques and technologies that allow businesses to build systems that can analyze data, understand patterns and ultimately take action.
To focus your efforts identifying the right problem is critical. What is the uncertain event/value/thing that you want to predict? This needs to be something very clear and explicit.

So what is AI?
Artificial intelligence (AI), sometimes called machine intelligence, is encompassing intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals and it has several different pieces.
(click)

Machine learning algorithms are just sets of rules and logic statements that are applied in a certain way to create a predictive model**.**
(click)
Neural Networks A Neural Network is a computer system designed to work by classifying information in the same way a human brain does. It can be taught to recognize, for example, images, and classify them according to elements they contain.

(click)
Deep learning can apply to almost any area of AI. Its analogous to the way people learn. We observe what goes on around us and draw conclusions from our experiences about how the world works. We then apply what we have learnt to help us deal with new situations that we find ourselves in. The more we experience and learn, the better our ability to make decisions becomes.

DL uses multiple layers to progressively extract higher level features from raw input. Each level learns to transform its input data into a slightly more abstract and composite representation.
This is very fascinating to me.

(click)
Regression Analytics – analyzes prior information to figure out groupings of that information. Basically a look backwards

(click)
Predictive Analytics takes the output of AI and uses it to drive future business processes. Basically a look forwards.

In the End Models only provide insight about what the customer will do. They don't tell you what should then be done on the basis of those predictions

WHAT MODEL DO I USE?

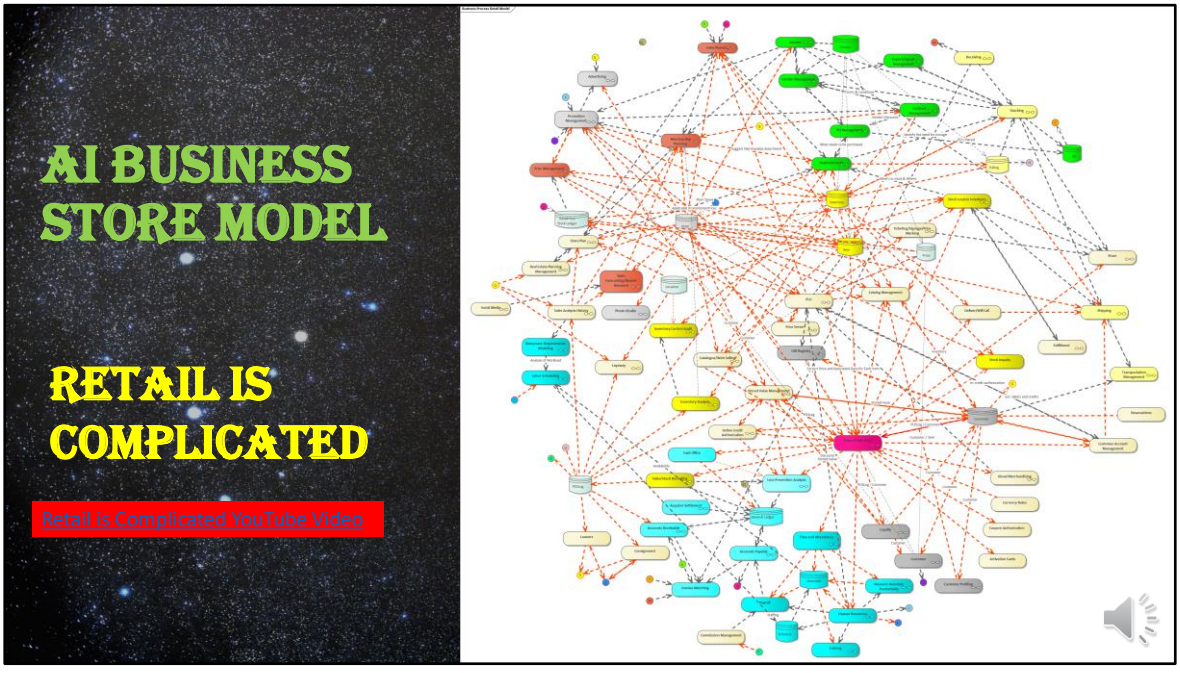
One way to sort this out is to use AI to figure out which AI ☺

In practice is there is no such thing as a best type of model that should always be used for all types of problems!!

WILL ROGERS

We will now dive into a variety of areas where AI has the potential to dramatically impact the retail world.

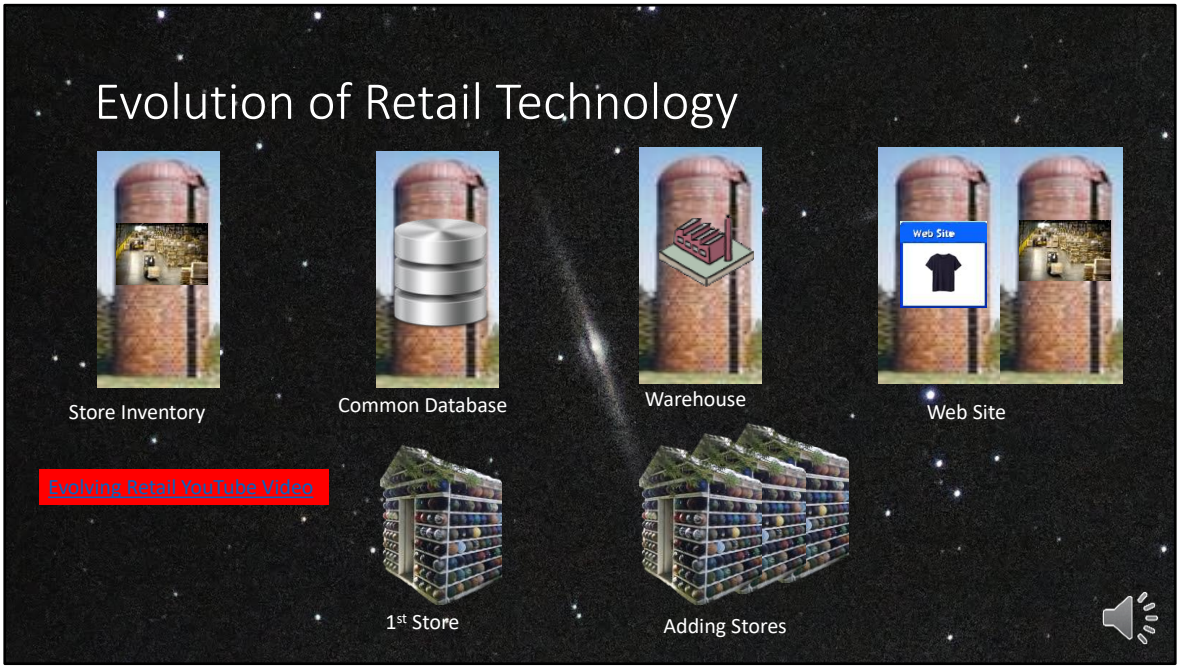
(click)
Warning: Please buckle up your seat belt and keep you hands inside the cart!!!



I built this model in 1998 and it has remained fundamentally the same with just a few additions. It represents every functional area in retail.

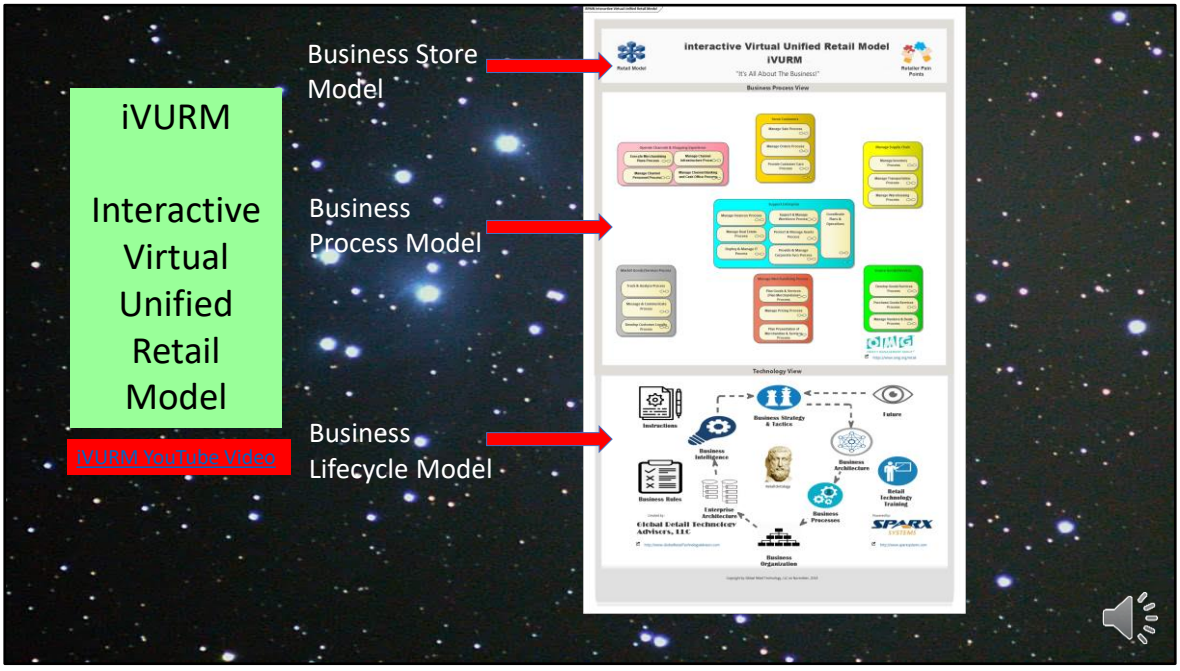
What is the potential impact of AI in retail? I wanted to focus this presentation on what AI impacts in retail. While going through this analysis, it became apparent the simple answer is almost every application in retail, as represented by this model, can be impacted by AI.


RETAIL
A LACK OF FLEXIBILITY



Retailers start with one store, then expand to more stores. That leads to needing a common database for all that information. Which then leads to a silo for inventory, warehouse, …

AI is part of what is forcing retail to take a wholistic view of itself. The future requires moving from this silo'd world to a fully integrated world. This is where my iVURM model helps. It helps tie the business to the technology and focus on those areas where the company expects to succeed.
AI is a key component of this migration to an agile world.



I love that today we saw several people talk about tying strategy to execution. For a long time I was speaking alone from the mountain.

Remember a retailer is in business to sell things, not to generate data. So the Model must come from the business down and not from the information up.

I've talked about this iVURM model – now let's take a quick peek at it.
Business fail not because they have a bad strategy but a poor execution of that strategy.

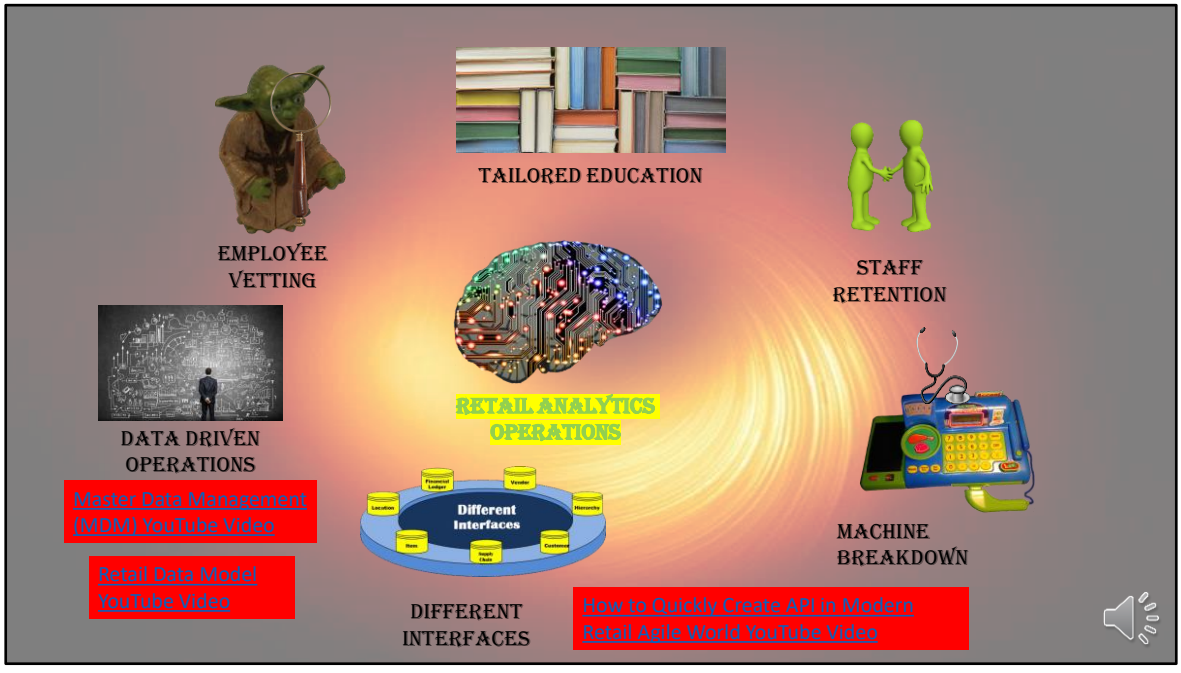
The three interconnected areas of the iVURM Model – discuss each

The iVURM focuses on the business by starting with the strategy, then focuses the effort on that which makes the retailer successful. It then ties the strategy together with the people, processes and information that are needed to execute that strategy. Finally it ties the retailer back to the strategy through the Business Intelligence. A full stable closed loop system.

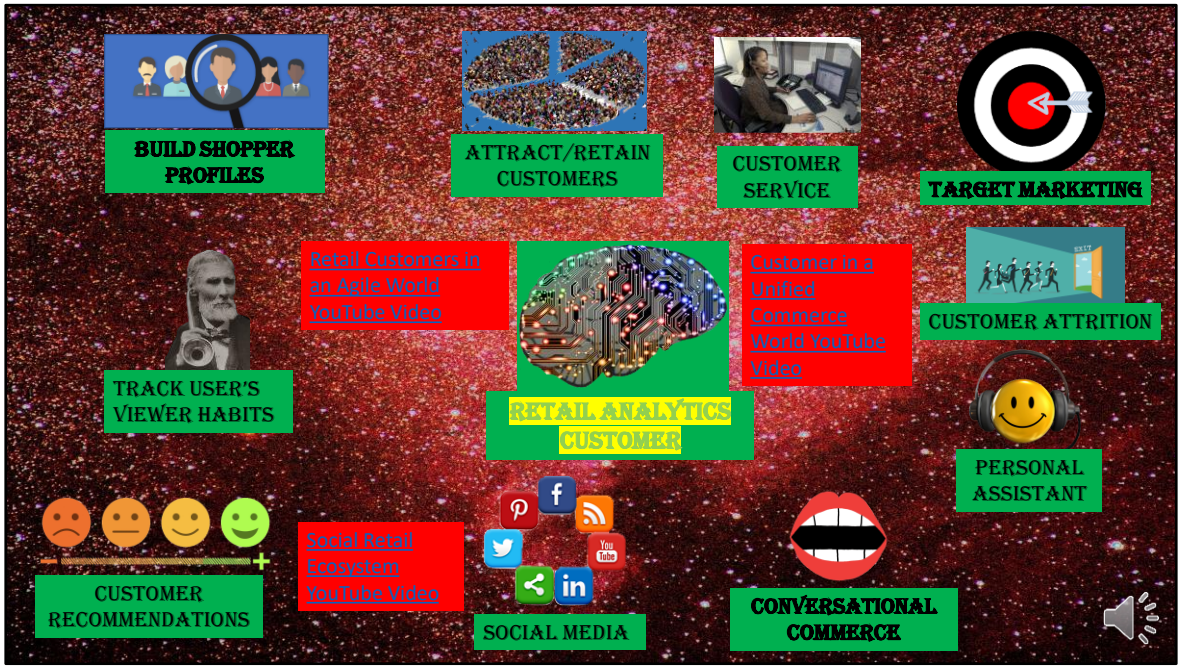
What is the point of this? You can't know where you are going until you know where you have been!!!

1. Provide template for a retail store
2. Provide the ability to quickly model the existing system
3. Provide the ability to quickly model the future system
4. Provide the ability to easily map from present to future

5. FYI: Every retailer who has seen this has wanted a copy. As an end result, I've shared this all over the world. What does that mean? They represent over 100,000 stores worldwide.



- **Tailored Education – tailor training to the individual associates needs**
- **Staff Retention -** what is the probability that an associate will leave their current position to take up another
- **Machine Breakdown -** When is a machine likely to fail in the near future
- **Data Driven Operations -** Fast-changing consumer preferences and agile competitors require retailers to be lean and enable a predictive, not reactive, approach to retail. Using a consolidated data framework driven by AI-enhanced insights will allow retailers to make informed decisions and optimize their operations, resulting in a purposeful and seamless shopping experience.
- **Different Interfaces -** Faced with an onslaught of information from all aspects of their business from supply chain to stores to consumers, retailers need to filter through the noise to transform these disparate data sources into consumer-first strategies
- **Employee Vetting – identify strengths and weaknesses then focus on their strengths while improving their weaknesses.**



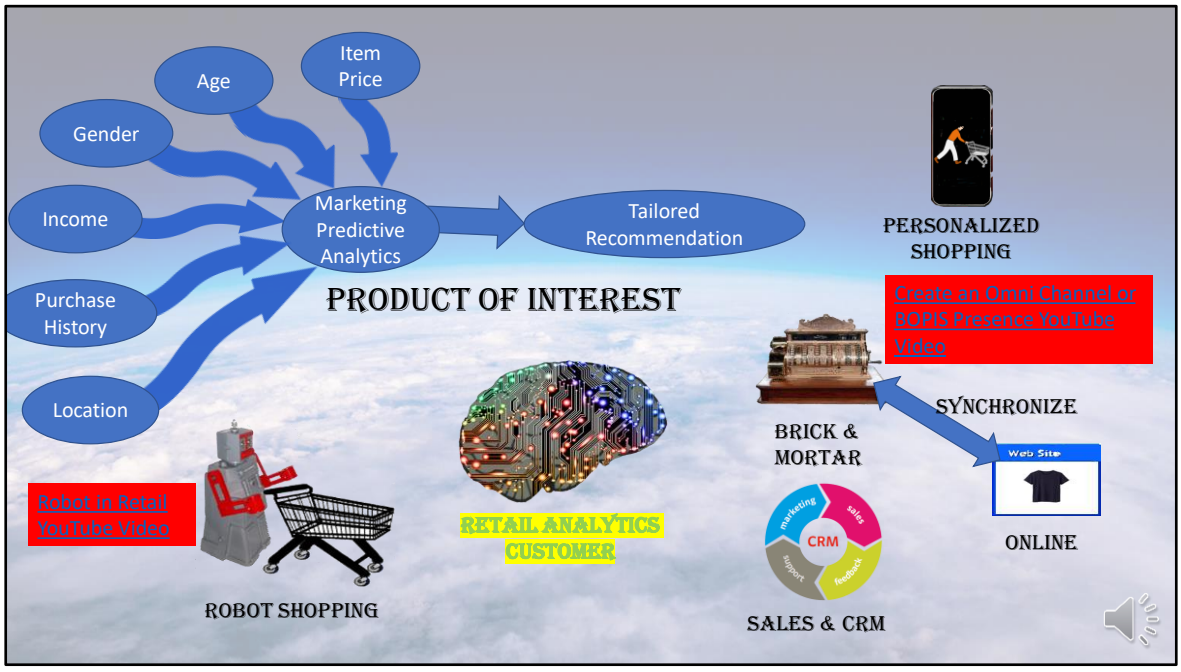
- **(click) Build Shopper Profiles-**

- **(click) Personal Assistant – chatbot -** can also be taught to understand this historical data, allowing shoppers to have personalized conversations with customer service "reps" at any time of day or night, without the hassle of waiting on hold. Increasingly, retailers are incorporating "sentiment analysis" to be sensitive to the state of mind of the customer. Some startups are taking the chatbot experience even further, developing bots with realistic facial expressions that offer a more responsive customer service experience with all the convenience of automation
    - Small to medium-sized companies will begin to build their marketing funnels (or purchasing funnels, which showcase a customer's journey toward the purchasing of a product or service) around information derived from intelligent chatbots.
    - Voice search technologies are growing rapidly. As these tools become

increasingly better at processing language in a more natural way, more users will turn to voice searches over traditional typed search queries.

- **(click) Conversational Commerce -** AI-supported conversational assistants use natural language processing to help shoppers effortlessly navigate questions, FAQs or troubleshooting and redirect to a human expert when necessary—improving the customer experience by offering on-demand, always-available support while streamlining staffing
- **(click) Customer Service -** By utilizing AI to process and learn from past interactions, retailers can tailor conversations with individual customers, drawing upon concerns or preferences those individuals have expressed in the past.
    - Be able to provide this digitally. Some 70 percent of buyers say they prefer digital interactions. Videoconferences and live chats are helping companies seal the deal; traditional phone calls are now a last resort
- **(click) Attract/Retain Customers -** With a plethora of innovative competitors providing shoppers with immersive shopping experiences, traditional retailers need to engage customers in a personalized and relevant manner that is unique and inspiring across all touchpoints.
    - Your shoppers expect you to know what they need and what they like, but more importantly, what they do not like
    - On the inside, Help them search the aisles for an elusive item. Mobile can be a map, a shopping list, a personal shopper, a salesperson and a product finder
    - In store - You provide deep product expertise (that is, help consumers decide what to buy and explain why it makes sense for them) in addition provide
- **(click) Customer Attrition** – Estimate the probability that a customer will buy rival products or stop using a product or service, based on history.
- **(click) Target Marketing -** Ads are shifting toward not just digitization but also personalization , powered by increasingly sophisticated algorithms and predictive models that analyze transaction data and digital-media trends
- **(click) Social Media -** Social media providers use machine learning to analyze what articles you've read in the past and the type of topics you discuss with friends. This then drives the content to be promoted to you.
    - OPINIONS CARRY MORE WEIGHT THAN EVER incorporates reviews and introduced shortlists to make it easy for people to discuss products and purchases with friends and family
    - Consumer Influencers: Artificial intelligence instruments can help companies to recognize and then utilize the most effective channels for reaching a particular market
- **(click) Customer Recommendations -** By recognizing and interpreting facial, biometric and audio cues, AI interfaces can identity shoppers' in-the-moment

emotions, reactions or mindset and deliver appropriate products, recommendations or support—ensuring that a retail engagement doesn't miss its mark.



- **(click) Personalized Shopping -** in personalizing and simplifying the shopping experience of each individual consumer
    - **MOBILE DEVICES DRIVE FOOT TRAFFIC** TO STORES
        - When searching for a store name or category, they expect to see a map with directions, a phone number - easily click-to-call, or special offers that match their location
        - If they are lost in the supermarket, searching the aisles for an elusive item. Mobile can be a map, a shopping list, a personal shopper, a salesperson and a product finder

- **(click) Synchronized Shopping -** SYNCHRONIZE BRICK AND MORTAR WITH ONLINE RETAIL Digital and physical shopping channels typically operate under a different set of initiatives and approaches, but treating these channels as distinct business units adds friction to customers seeking a seamless shopping experience and leads

to operational inefficiencies

- **(click) Sales & CRM -** CRM and marketing systems learn a consumer's behaviors and preferences through repeated interactions to develop a detailed shopper profile and utilize this information to deliver proactive and personalized outbound marketing—tailored recommendations, rewards or content.
- **(click) Robot Shopping -** As customers look to build confidence in a purchase decision, a**utomated assistants** can help narrow down the selection by recommending products based on shoppers' needs, preferences and fit. Then help them go find the product or pick it for them.
- **(click) Product of Interest –** Customer demographics and purchase history can help tailor the recommendations to the specific customer. It can also enable cross-selling and up-selling for things they didn't know they needed or desired. Just like momma use to do.

- **(click) Effective Marketing Campaign** Retail marketers deal extensively in research and analysis, fitting and molding narratives to match key demographics and targeted consumers. As consumers filter out advertisements that don't apply to their unique lifestyles, it's even more imperative that marketers leverage the analytical power of AI to build smarter, more effective advertisements that resonate with audiences
- **(click) Product Recommendations -** by utilizing location-based analytics, companies can accurately determine when a customer is in close proximity to a particular retail location, and ensure that they receive a notification regarding promotions that a store is having
- **(click) Seamless Product Discovery – Cross Sell/Up Sell**
- **(click) Differentiate Products -** To drive continued interest, retailers need to differentiate their products and offer consumers compelling service and experiences. By integrating predictive analytics to gather more market insight, retailers can lead with innovation rather than react to change
- **(click) Real-Time Pricing – Be careful from a legal perspective**
- **(click) Merchandising**
    - Visual Curation Algorithmic engines translate real-world browsing behaviors into digital retail by allowing customers to discover new or

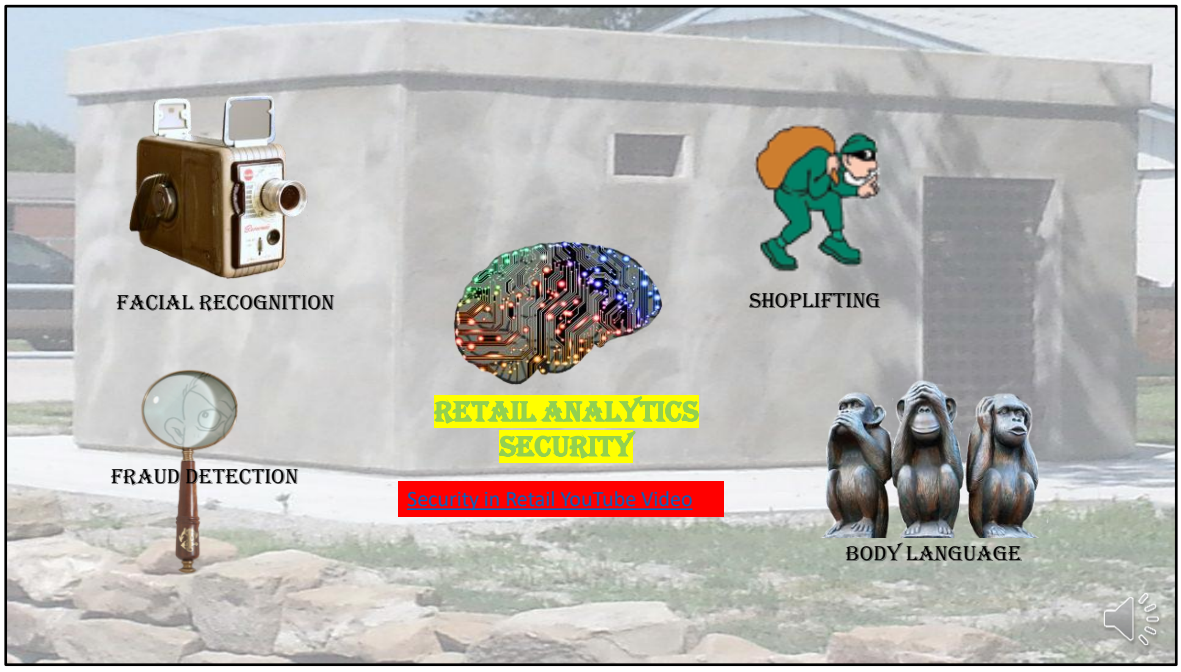
related products using **image based** search and analysis.

- Demand Forecasting Mining insights from marketplace, consumer and competitor data, AI business intelligence tools forecast industry shifts and make proactive changes to a company's marketing, merchandising and business strategies

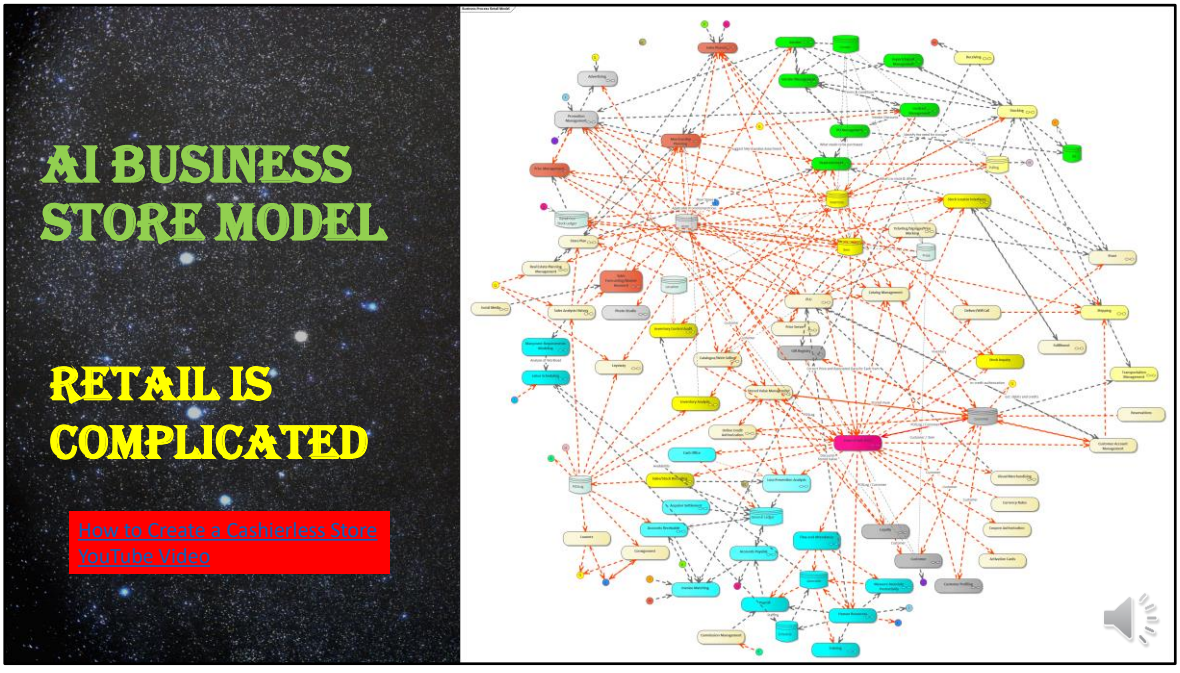
- **(click) Competitor Analysis -** This includes insights into their revenue streams, more successful products, personnel, key competitive advantages, challenges they face, and performance on social media.

- **(click) Self-Driving Automobiles - Alliance for Parking Data Standards helped create this standard**
- **(click) Inactive Inventory**
- **(click) Forecast Inventory**
- **Optimize Inventory**
- **(click) Manufacturing**
- **(click) Warehouse Robots -** Video on my presentation to the Retail Analytics Council on Robots in Retail
- **(click) Flexible Supply Chain** - In order to service a wider range of customer demands that are moving from mainstream to niche, retailers need to rethink their traditional supply chain in favor of adaptive and flexible ecosystems that can quickly respond to consumers' shifting behaviors.
    - **Figure out what product goes where in the supply chain**
    - Amazon, for example, recently received a patent for "anticipatory shipping," which predicts what a shopper is likely to order and sends it to the shipping center nearest to them before they even order it
- **(click) Logistics** with Robots
    - **delivery robot** can keep food and drinks at the appropriate temperature,

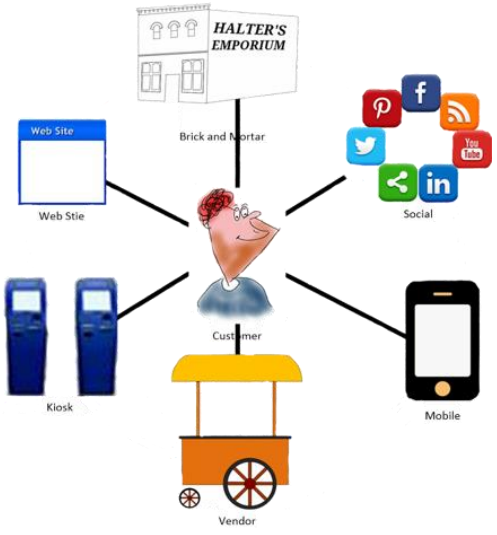
- **Navigation** - sensors help it navigate a best travel path for delivery.
- **Drone Delivery** parcel delivery via drones
- **Provide Same-Day Delivery –**



- **(click)Fraud Detection –** what's the probability that a fraudulent transaction is occurring.
- **(click)Facial Recognition -** deep neural networks are more accurate than humans at detecting intricate facial images. Facial recognition is progressing so rapidly that facial recognition technology can now infer political orientation from naturalistic facial images
- **(click)Body Language -** artificial intelligence to detect **body language that can** suggests someone intends to shoplift and alerts staff so they can intervene
- **(click)Shoplifting** AI software can hunt for potential shoplifters, using footage from security cameras for fidgeting, restlessness and other potentially suspicious body language. algorithms analyze security-camera footage and alert staff about potential thieves via a smartphone app. The goal is prevention; if the target is approached and asked if they need help, there's a good chance the theft never happens. This combines capabilities such as image recognition, video, fast transmission, IoT (Internet of Things), Big Data, Mobility, Cloud Computing, Machine Learning, Neural Networks, and Predictive Analytics.



Oh no not this one again.
Retail is complicated and AI can fit into almost all applications. I hope you can now get a sense of how enormous the opportunity is.



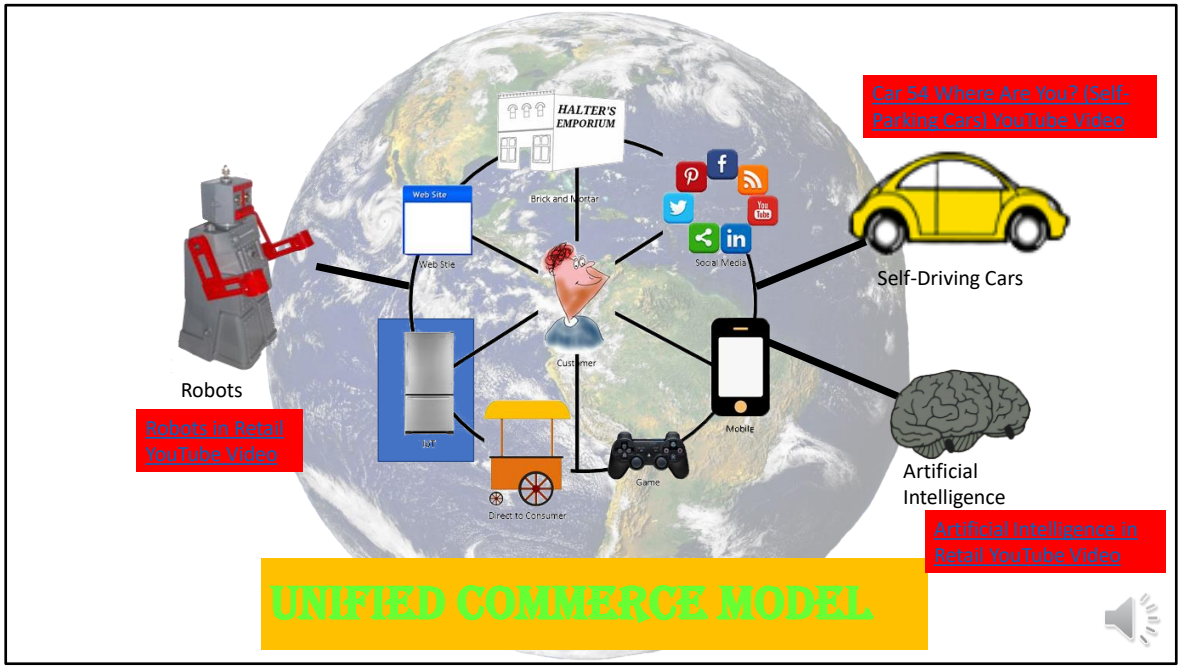
OMNI-CHANNEL MODEL

Create an Omni Channel or BOPIS Presence YouTube Video

AI will have an impact on the new agile retail world.

AI technology allows organizations to connect customer insights to differentiate the buying process, provide streamlined and more consistent omnichannel customer experiences

Why is that important? Because I've seen the massive changes that have been and are taking place in retail, foodservice and hospitality. Lately this has been mostly accelerated by the pandemic.
On top of that driver, we have this Omnichannel thing and the latest extension Unified Commerce.



Unified Commerce takes Omnichannel and adds in robotics, IoT, drones, self driving cars, etc. To make it work effectively will require extensive AI in managing this new world. In addition AI will enable not only what has happened but will help figure out what will happen.

- Human expertise is required to support automated AI based systems, especially where those systems are being used to make risky or controversial decisions about people.
- Never sell whiskey to children
- Or Do not send offers to people with an alcohol problem

- Appropriate checks and balances need to be put into place to prevent misuse of decision-making systems.

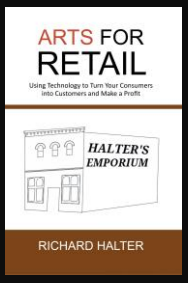
From an ethics viewpoint what are some of the risks associated with AI?

- **Creates Significant Challenge for the retailer**
- **Potential Reputational Damage -** there is a lot of evidence that if one is thinking about the long term, then adopting an ethical code behavior delivers a real bottom line benefit.
- **Possible Revenue Loss**
- **Possible Regulatory Backlash**
- **Potential Criminal Investigations**
- **Diminished Public Trust**

- **Create Ethics committee** – undertake an ethical risk assessment as a part of the design phase.
    - A very easy mistake to make is to think that if it's legal then it must also be ethical

- There was a presentation on this today. Please check it out. Ethics in Retail is a very serious matter.

Check Out My Retail YouTube Videos at
HTTPS://www.YouTube.com/User/RichardTheGeek/Videos



ARTS for Retail YouTube Video

Richard Halter
WIZARD OF POS
Richard.Halter@cox.net

Thanks for letting me talk – there are some 50 videos describing various aspects of retail.
In addition there is my book called “ARTS for Retail” Enjoy.