

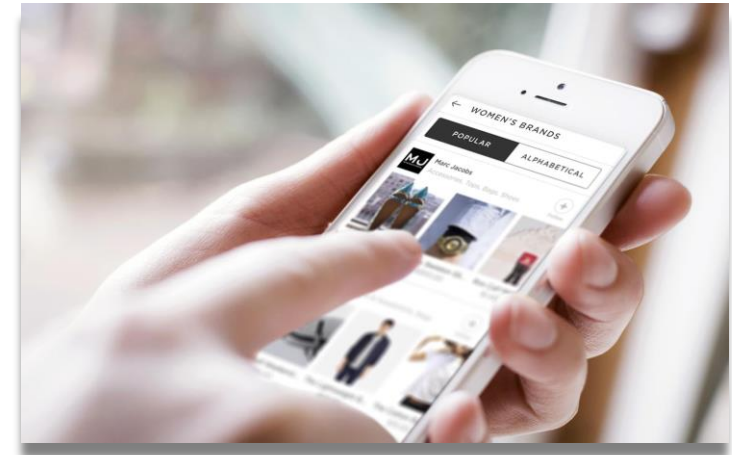
Retail - today's scenario (1/2)

Before the advent of the Internet and smartphones



Shopping was a simple process

After the advent of the Internet and smartphones



Shopping has become complex

Retail - today's scenario (2/2)

Key Concerns in Retail Space

- ❑ Moving from generalized to personalized interactions with customers
- ❑ Managing customer engagement and dealing with customer retention issues
- ❑ Continually manage and evolve omni-channel strategies given the proliferation of connected devices
- ❑ Understanding the impact of changing customer behaviour
- ❑ Managing the new horizon of security threats, both virtual and physical



What is IoT?

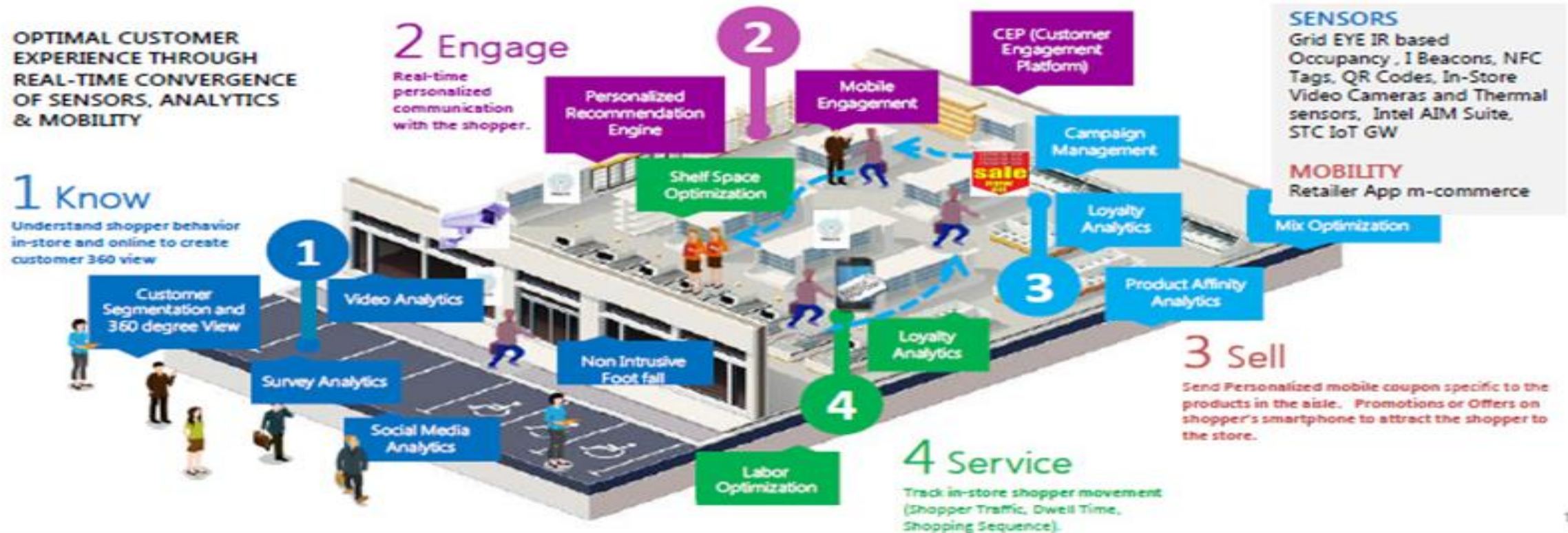
- ❑ An army of small semiconductor-based robots, all connected over the Internet and able to take decisions on their own or based on higher- level decision-making inputs from other devices or control centers
- ❑ The next generation of personal computing, whereby objects interact, potentially independently, with each other and with their environment

Trends not to be missed!

- ❑ Value of the global connected retail market was \$16.3 billion in 2016 and \$19.46 billion in 2017.
- ❑ By 2025, value of the market estimated to reach \$82.31 billion
- ❑ During the forecast period of 2017 to 2025, the demand in the global connected retail market is projected to increase at an impressive compound annual growth rate of 19.8%.

How IoT can transform Retail (1/2)

Know | Engage | Sell | Service



IoT -Key Benefits

Transformation of operations

- ❑ 2 ways:
 - ❑ Streamline supply chain
 - ❑ Seamless in-store operations
- ❑ Amazon - connected warehouse operations
- ❑ Reduction in shrinkage
- ❑ Simplification of checkout - geo-fencing

Improved Shopping Experience

- ❑ Easy In-store navigation
- ❑ Profiling of customers to understand style, preferences better
- ❑ Sensor-enabled shopping carts - understand journey inside the store
- ❑ Helps retailers understand and meet customer expectations

Improved Marketing

- ❑ Promotions based on location of the customers
- ❑ Targeted promotions based on profiling data
- ❑ Merges the physical and digital realms

IoT - Key Challenges

❑ Value Chain Collaboration:

Unprecedented **collaboration, connectivity and coordination** for each IoT element individually as well as an integrated information system.

❑ Data Movement, Management, Security and Ownership

Huge voluminous data

❑ Infrastructure

Need additional investment in better asset management, downtime avoidance, visualization engines, data analysis tools, machine learning and AI (Artificial Intelligence) capabilities

❑ Privacy:

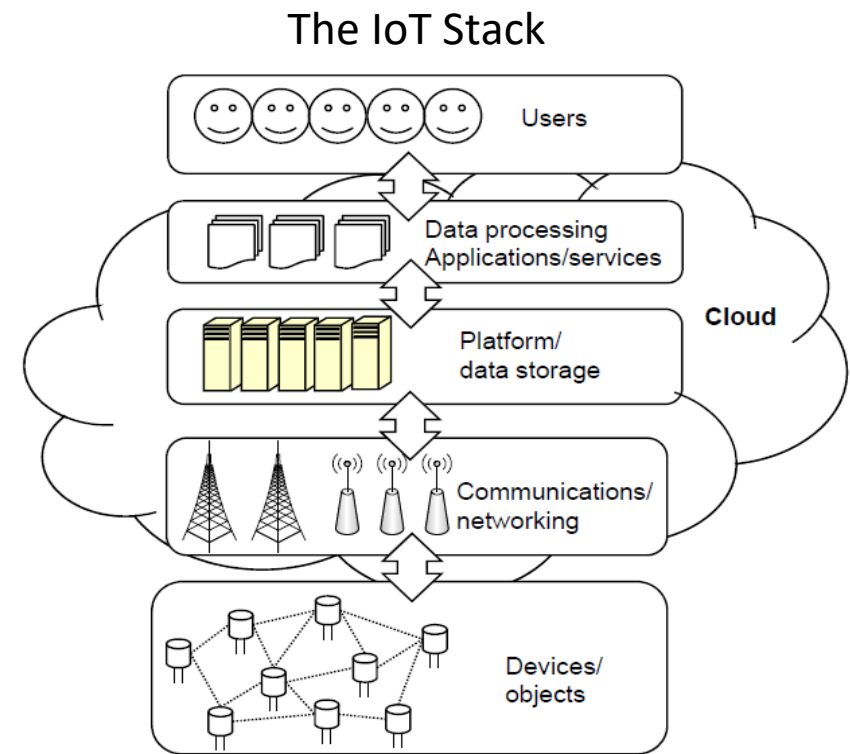
Customers fear misuse of data collected

❑ Security:

Security issues with regards to connected devices over heterogeneous networks

IoT Technologies

- ❑ Internet of Things consists of 5 layers across 3 stacks
- ❑ Hardware – Base layer
 - ❑ Devices that collect data
 - ❑ Devices that transmit data
- ❑ Software – Cloud platform
 - ❑ Data storage:
 - ❑ Analytics
- ❑ End user level
 - ❑ Integrated applications
- ❑ Can have overlap between layers as data stores will have analytics built in



IoT Retail – In Store Technologies (1/2)

- ❑ Sensors and Cameras
 - ❑ To monitor product status and customer traffic
- ❑ Visible Light Communication (VLC)
 - ❑ Light sources such as LED light bulbs are used to send information through visible light that can be received and read by a smartphone camera.
 - ❑ Used to send location-based notifications to shoppers' smartphones.
 - ❑ Introduced in 2015 by French retailer Carrefour in its hypermarket Eura Lille in Lille, France
- ❑ Bluetooth Beacon
 - ❑ A wireless transmitter technology that can communicate with compatible apps installed in Smartphones using Bluetooth signal.
 - ❑ Enables proximity-marketing by direct communication between shopper smart phones and the shelf.
- ❑ Bluetooth low energy platform by Razorfish recognizes a shopper's smartphone and sends information about items in stock as the customer enters the store.

IoT Retail – In Store Technologies (2/2)

❑ Near Field Communication:

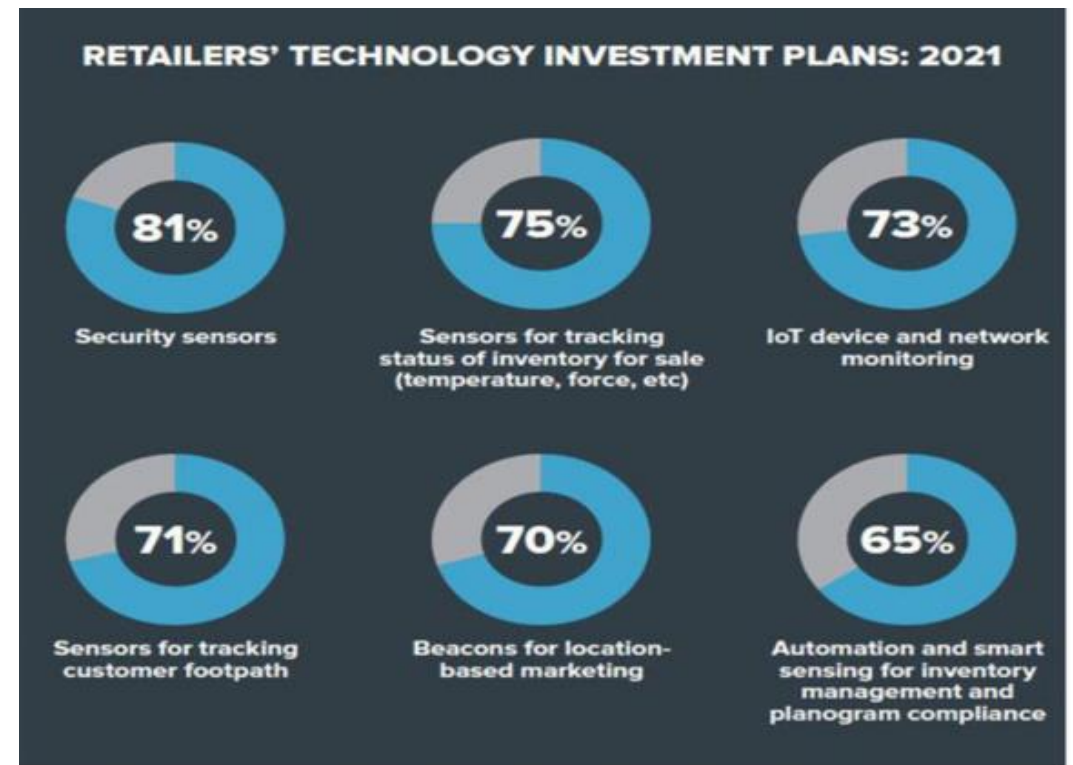
- ❑ Short range wireless connectivity used to enable communication between devices.
- ❑ Used in mobile payment systems. Provides information about an item, when the customer scans the NFC tag

❑ RFID Devices

- ❑ Use radio waves to identify and track items and to enable communication between devices.
- ❑ Used mainly for mainly for asset tracking in stores and warehouse, theft prevention etc.
- ❑ Low chip prices and significant benefits have made RFID the clear choice in retail industry for inventory management and for integration of instore connected devices.
- ❑ Fashion firm Rebecca Minkoff operates a Connected Store, that use RFID to recognize the items in the room and that suggest what other sizes or color are available in stock

Adoption Of IoT Technology In Retail

- ❑ The insights from Zebra 2017 Retail Vision study indicates that by 2021, retailers are planning investments in Internet of Things (70%), machine learning/cognitive computing (68%) and automation (57%).
- ❑ IoT will play an increasingly important role in security across all operations, in addition to supply chains, and enabling customer experiences and location-based marketing.



IoT Use Cases In Retail (1/3)

- ❑ Smart Lighting/Thermostat
 - ❑ Sensor laden fixtures that detect store light and temperature, collect data and analyze data to create patterns that regulate lights or temperature. Implemented in smart buildings. E.g. Honeywell building sense
- ❑ Smart Shelves
 - ❑ Application of RFID technology to improve inventory management.
 - ❑ Shelves equipped with sensors connected to an IoT platform, alerts the store associates when stock is missing
- ❑ Smart Robots
 - ❑ Autonomous mobile devices that can navigate through the store and complete a scale of repetitive, predictable processes in retail stores, warehouses.
 - ❑ Recently implemented by Walmart
- ❑ Interactive Fitting Rooms :
 - ❑ Features mirrored display that use RFID technology to recognize the items brought by the customer, rendering the products on the screen. E.g.: Connected store by Rebecca Minkoff in New York



IoT Use Cases In Retail (2/3)

- ❑ Smart Shopping Carts
 - ❑ Sensor enabled carts that are able to communicate with other smart- tagged items in the store.
 - ❑ For navigating shoppers through the store.
- ❑ Product information
 - ❑ Customers can use mobile phone to acquire live information to merchandising on trends or re-stock requisitions while in store
 - ❑ Can avoid prior research at home or speaking with store associates.
- ❑ Theft Prevention
 - ❑ Retailers can create a virtual zone or barrier around the stores using RFID, to prevent theft and loss.
 - ❑ Geo-fencing enabled in IoT devices can benefit retailers to track the movement of the products, customer or employees

IoT Use Cases In Retail (3/3)

❑ Automatic Checkout

- ❑ Item-level RFID tags and an IoT enabled scanner at the exit of the store enable customers to scan all items at once as they walk out with their trolleys, with the value of the purchases simultaneously charged against the customers' account

- ❑ E.g. Amazon Go

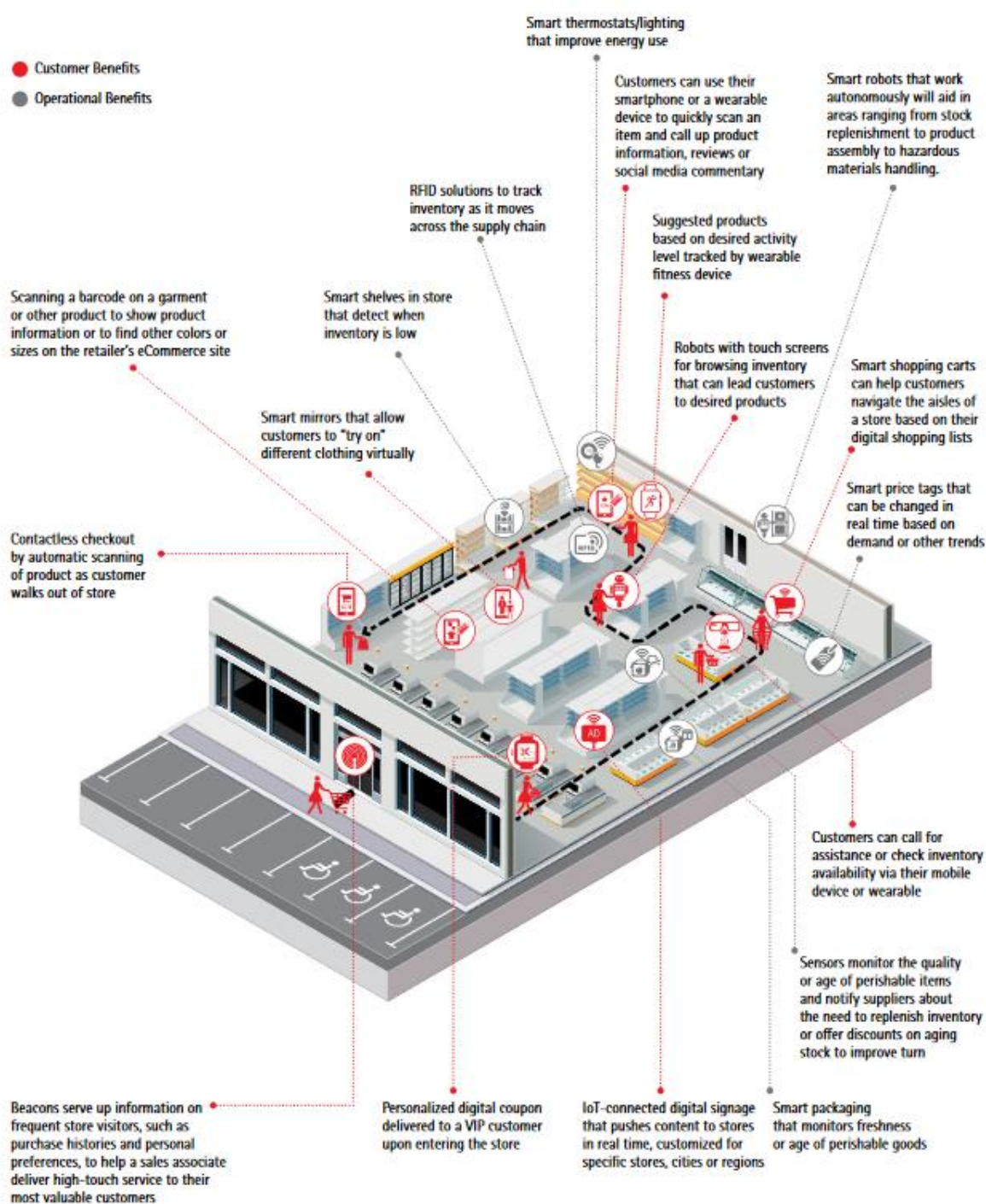
❑ Connected Cameras

- ❑ To gather customer insights
- ❑ Capture facial data points and use facial recognition to gather information about customers, time spent in a particular area, their behaviors at stores

❑ Digital Signage

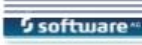
- ❑ Boards that change messages based on sensor information to direct traffic to various parts of the store.

- Customer Benefits
- Operational Benefits



Vendor Assessment

- ❑ Most retailers do not have sufficient technology expertise and in-house resources for implementing and managing IoT solutions
- ❑ Software vendors provide IoT ecosystem in partnerships with other major players in IoT technology
- ❑ Major IoT platforms evaluated are
 - ❑ IBM Corporation
 - ❑ SAP
 - ❑ Kaa

	Publicly Listed		Private
	Incumbent Vendors	New Entrants	New Entrants
Applications	    	   	
Analytics	 	     	  
Data Stores	   	   	     

1. IBM Vendor Evaluation (1/2)

- ❑ Leader in IoT platforms
- ❑ IBM Watson launched in 2015 offering IoT capabilities
- ❑ IoT capabilities
 - ❑ Connectivity : Offer secure connectivity, device management and visualization
 - ❑ Risk Management/ Security : Proactive protection
 - ❑ Information Management : data storage and transformation
 - ❑ Analytics : Predictive, cognitive(using Machine learning, video/image analytics etc)

1. IBM Vendor Evaluation (2/2)

- ❑ IoT Retail functional areas
 - ❑ Customer experience: deliver contextual, personalized activations, offers etc. guided shopping, automated checkout, understand in-store behavior
 - ❑ Store operations : Optimize store layouts, monitor assets and enhance security and loss prevention. Watson IoT Inventory management RFID tags can capture data including GPS location, temperature, pressure & other information
 - ❑ Merchandising and supply chain : Fleet management real-time demand planning and track product quality and safety.
- ❑ Pros
 - ❑ A strong analytics brand with Watson
 - ❑ Multi Layered security strategy
- ❑ Cons
 - ❑ Visualization capabilities to be improved

IBM– Honeywell Ecosystem Partnership For Retail

- ❑ IBM partners with the Honeywell building sense to deliver integrated solutions for retail in store operations
- ❑ Functional areas supported in retail are
 - ❑ Energy management: Save on energy costs by optimizing resource use within the facilities
 - ❑ Food freshness: Maintain product freshness and shrink
 - ❑ Predictive maintenance: Improve asset uptime and reliability

2. SAP - Vendor Evaluation (1/2)

- ❑ Strong performer in IoT
- ❑ Most recent launch of SAP Leonardo as their Digital Innovation System which integrates IoT, AI, Machine Learning, Big Data, Analytics and more to help businesses connect with people, products, assets, customers
- ❑ Dense portfolio of IoT-related offerings
- ❑ IoT Platform Capabilities
 - ❑ Connectivity management
 - ❑ Device management
 - ❑ Data management
 - ❑ Visualization
 - ❑ Application development
 - ❑ Advanced Analytics

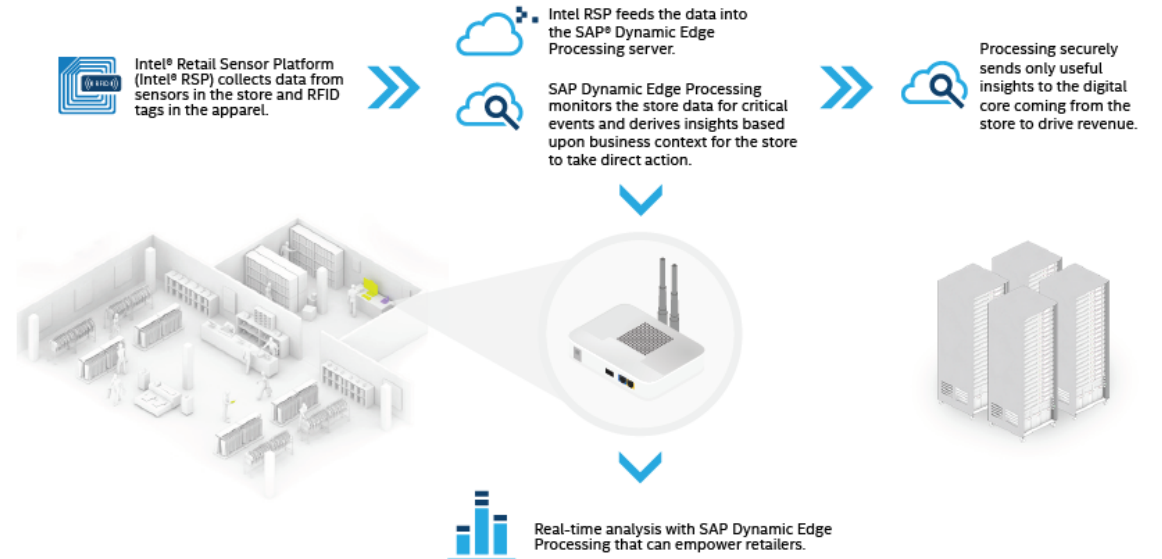
2. SAP - Vendor Evaluation (2/2)

- ❑ Functional areas served in ecommerce and retail
 - ❑ Customer engagement and personalization: Real time customer data insights to create unique shopping experience
 - ❑ Store and digital commerce: In store merchandising and inventory management.
 - ❑ Omni channel order management: Manage and process customer orders and returns from any channel
- ❑ Pros
 - ❑ Focus on Edge strategy
 - ❑ Highly rated customer support
- ❑ Cons
 - ❑ Capabilities are spread out among several cloud services

SAP – Intel Ecosystem Partnership In Retail

- ❑ Co-engineered an IoT platform to help the retailers to manage, monitor, analyze and automate the in-store operations
- ❑ Functional areas
 - ❑ Inventory management : Check stock level and send automatic restock alerts
 - ❑ Customer Experience : Reduced check out wait times and superior customer service by knowing exactly what products are where

RETAIL PLATFORM COMPONENTS AND COMMUNICATION FLOW



3. KAA -Vendor Evaluation (1 / 2)

- ❑ Leading open source IoT platform
- ❑ A middleware platform for IoT that allows building complete end-to-end IoT solutions, connected applications and smart products
- ❑ IoT Capabilities
 - ❑ Connectivity : Connect and manage unlimited number of devices
 - ❑ Cross device interoperability, Security
 - ❑ Device monitoring
 - ❑ Data management for connected objects ,Data Analytics

KAA -Vendor Evaluation (2 / 2)

- ❑ Functional areas supported
 - ❑ Inventory management :Tracking goods with RFID tags. Optimized inventory management by ensuring on shelf availability, eliminating items loss or theft incidents
 - ❑ In store digital signage to attract customers and navigate them through products discounts and loyalty programs.
 - ❑ Customer Experience: Personalized shopping experience for customers using Bluetooth beacons
 - ❑ Customer preference analytics
- ❑ Does not have IoT ecosystem partnership
- ❑ Pros :
 - ❑ Flexible, open source. Ideal for implementing applications for existing architecture.
 - ❑ Low cost

IoT Platforms Vendor Comparison

Evaluation Criteria	IBM Watson -IoT	SAP	Kaa
Market Position	Leader in IoT Platform	Major Player	Major Open source IoT platform
Capabilities Offered	- Connectivity, - Risk Management - Information Management - Analytics	- Connectivity management, - Device management - Data management - Edge Services	- Connectivity - Cross device interoperability - Device Monitoring - Data Analytics
Deployment Models	Public, Private, On-premise	On premise , cloud or in a hybrid architecture Open platform - runs on Azure, AWS et	Private, on-premises, cloud, hosted, hybrid
Training Services	Yes	Yes	Training and trouble shooting guide
Cost of Ownership	Usage based pricing	Subscription based- Predefined price and engagement is time bound, Number of Devices etc.	Services + Support. No Annual fee
Advantage	Multi layered Security Strategy	High Customer Support, Edge Strategy	Full visibility and control, Cost efficient
Disadvantage	Visualization Capabilities to be improved	Capabilities spread across different cloud services	Only middle ware services. No ecosystem partnerships
Future Goals and Plans	- Node-RED for rapidly building IoT Applications - Blockchain for supply chain management	Integrations in Machine learning, Big data Focus of edge services	New integrations, as well as on functional, performance, and security improvements for Kaa

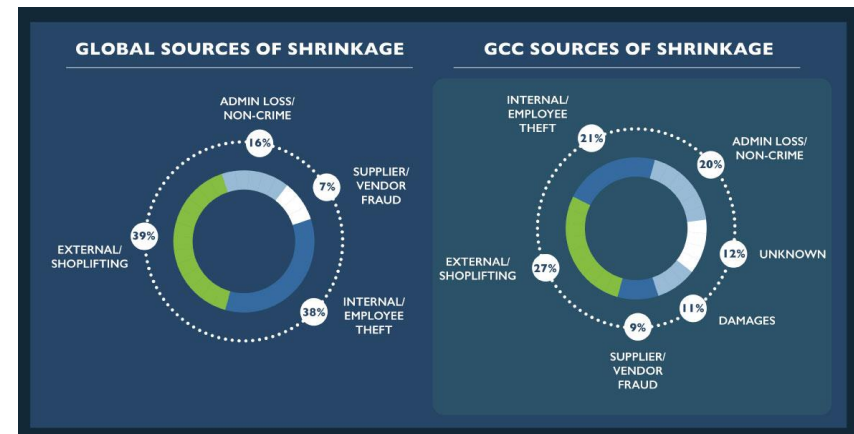
Business Case for IoT in Retail (1/2)

- The Internet of Things creates value in the below areas:

Huge impact on labour costs (30%)



Significant reduction in shrinkage costs (50%)



Business Case : Case in Point - Whole Foods Market Inc (2/2)

Operations Data without IoT

Statement of Operations Data	\$Millions	%
Revenues	15,724	100
Cost of Goods Sold	(10,313)	-65
Gross Profit	5,411	35
Labor Costs	(1,572)	-10
Shrink Costs	(314)	-2
Other Costs	(3525)	-8
EBIT	786	5

Potential Opportunities with IoT

Statement of Operations Data	\$Millions	%
Checkout staff costs	(943)	60% of Labor
IoT Labor Costs Reduction Opportunity	471	-30% of Labor
IoT Shrinkage Costs Reduction Opportunity	157	-50% of Shrink
Gross IoT Opportunity	628	4% of Revenues
Cost of Rollout	(300)	
Total EBIT with IoT Rollout	1,114	-8
Uplift		40

Potential Increase in EBIT will be around 40%

Recommendations

- ❑ IoT solutions in retail helps retailers to achieve a true omnichannel experience by bringing digital technologies to physical stores.
- ❑ Offers opportunities in: customer experience, the supply chain, and new channels and revenue streams
- ❑ Key recommendations
 - ❑ Act fast - Retailers that hesitate to develop and execute an IoT strategy will open the door for competitors, to swoop in and capture early IoT mind share and market share.
 - ❑ Early adopter of these technologies will be benefited in conjunction with a clear business objective
 - ❑ Redefine the relationship with stakeholders in supply chain and choose business partners who are ready to help them capitalize on the increased efficiency brought by IoT.
 - ❑ Adoption of IoT technologies also presents the challenge of data privacy
 - ❑ IoT strategy should not be to replace sales assistants.

Our Reflection

- ❑ In this paper, we focused our study on how the Internet of Things affect retail industry as the initial study at the beginning of the semester gave us a sense that the topic is vast.
- ❑ The study results, analysis are applicable only to the retail industry and appropriate research has to be carried out if it were to apply to other industries.
- ❑ The research gave us an opportunity to understand different aspects of the IoT solution - vendor assessment, cost-benefit analysis of the IoT solution.
- ❑ While the huge potential of the Internet of Things in retail set-up has been discussed in this paper, the research has its own limitations.
- ❑ The figures/data used are primarily based on the secondary research. An additional primary research would have supported the research with concrete and real-world information. Since the course did not warrant the primary research to be done, the possibility of it was never explored.
- ❑ Also, the vendor pricing information related to the IoT solutions was difficult to find through secondary research.

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