

IoT as an aggregator for industry and customer: A conceptual model

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Abstract:

Suppose if we ask common public on the street to define the term, “*The Internet of Things* “ and you will get a curious look to you with a big question mark on their face. Although many people don’t use the term “Internet of Things (IoT)”, but most of them might have experienced the IoT with smartphones, tablets, and PCs which they already use on a regular basis. Internet and smart phone users’ penetration has been increasing in last four years. A report by IAMAI and KPMG projected that India will reach 236 million mobile internet users by 2016, and 314 million by 2017. There is a huge business opportunity for e-commerce industries to connect to their customers and prospective customers in real time. Even other industries concentrating on making near connect using IOT with Internet and smart phones, has changed dimensions of businesses and created new innovative markets and its approach.

The everyday physical objects that could be connected through the IoT run from the simple and mundane. By 2018, Internet of Things (IoT) number will reach 9 billion, which is from combinations of smartphones, tablets, PCs, wearable computers, smart TVs and machines. Today, IoT produces about \$1 trillion (£600 billion) in revenue, and that figure is expected to double by 2016.

The Internet of Things, like big data, is creating an impact across industries, because every industry is becoming virtual and is progressing towards a device or product that can be further utilized to boost profits or cut costs.

Only one mobile device has created the 10.7 Billion sales in 2014. If mobile devices are connected with multiple devices nearby and could communicate with each other informatively then the vibration of this kind of exchange of information can create multiple business opportunities and revenue.

This research leads to designing a model for an industry’s opportunity where IoT can added advantage for industries to understand better and serve their customer using Internet, IPV6, smart phone and sensors. These are interconnected in such a way that the information mutually transmitted can create a better value proportion by identifying the untouched, untapped, un-attended information about consumer or customer about the industry or its products in real time. Tapping this gap can lead to add-on to the current business without spending much time and money. This ease of information making available will be beneficiary to the customer and marketers where they can get the information or details of anything related to product or service will be in a fingertip.

The study is targeting a conceptual Eco-model which is expected to attain seamless information exchange where both the parties (marketer and buyers) can be looking at mutual services which can maximize their benefits.

Highlights

- Presents vision and motivations for Internet of Things (IoT).
- Application domains in the IoT with a new approach in defining them.
- Cloud-centric IoT realization and challenges.
- Open challenges and future trends in Cloud Centric Internet of Things.

Introduction:

"In the next century, planet earth will don an electronic skin. It will use the Internet as a scaffold to support and transmit its sensations."

- *Neil Gross 1999*

Jane Bennet, a famous materialist's predictions have become reality in today. She said in her book "Vibrant Matter: *a political ecology of things*", that Objects have a life because of their capacity to make a difference in the world and to have effects" (Parks and Starosielski, 10) and also she says "If objects provided with life that is innate, what can be the power if these objects go further and were capable of storing data, sensing the environment and communicating with each other?" Now a days, we are seeing this as reality in our life and is made possible by IOT (Internet of Things) with current new electronic devices.

Amid a progressively connected culture and consumer base, the Internet of Things (IoT) inimitably matches the imperious for relevance—not just through connectivity in communications but in accurately connecting all rudiments of brand experience. Data connections deliver insights; when applied, these insights inform and improve products, services, and ultimately customer experiences and relationships. Coupling digital connections to raise bottomless human connections is the highest opportunity of IoT.

As in the premature days of social media, companies that embraced the technology crown on will fare far better than those who dismiss it as a mere mania for Millennials. A recent study found that while 87% of consumers were unfamiliar with the term Internet of Things, 65% plan to adopt connected technologies in the future.

Adoption of the Internet of Things surfaces tremendous challenges—around power, informatively, latency, costs, and industry connotation on shared standards, protocols, and infrastructure for interoperability; around data integrity, security, access, and control; and around risk aversion, trust, and privacy. Each of these virtue and are subjects of upcoming study. This model study aims to help executives, brand strategists, marketers, technologists, innovators, and internal change agents make sense of the Internet of Things by understanding what it is, why it is important, what it can look like, the opportunity it presents for enhancing every step of the customer experience, and how to establish its priority.

The Internet of Things - Definitions

There is no proper description for the Internet of Things and it is a challenge. There are countless author's provided different definitions based on their one's subject to the biases. There is a definition which has gained recognition among experts is the one by Ovidiu Vermesan and Peter Friess in their book "Internet

of Things - Global Technological and Societal Trends":

"The Internet of Things could be conceptually defined as a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual "things" have identities, physical attributes, and virtual personalities. These same things use intelligent interfaces and are seamlessly integrated into the information network."

As identified by Atzori et al. [8], Internet of Things can be realized in three paradigms—internet-oriented (middleware), things oriented (sensors) and semantic-oriented (knowledge). Although this type of delineation is required due to the interdisciplinary nature of the subject, the usefulness of IoT can be unleashed only in an application domain where the three paradigms intersect.

The RFID group defines the Internet of Things as—

The worldwide network of interconnected objects uniquely addressable based on standard communication protocols.

According to Cluster of European research projects on the Internet of Things [2]—

‘Things’ are active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment by exchanging data and information sensed about the environment, while reacting autonomously to the real/physical world events and influencing it by running processes that trigger actions and create services with or without direct human intervention.

According to Forrester [9], a smart environment—

Uses information and communications technologies to make the critical infrastructure components and services of a city’s administration, education, healthcare, public safety, real estate, transportation and utilities more aware, interactive and efficient.

Rajkumar Buyya (2013) provided the definition more user centric without restrict it to any standard communication protocol. This will consent long-lasting applications to be developed and positioned using the available state-of-the-art protocols at any given point in time.-

Interconnection of sensing and actuating devices providing the ability to share information across platforms through a unified framework, developing a common operating picture for enabling innovative applications. This is achieved by seamless ubiquitous sensing, data analytics and information representation with Cloud computing as the unifying framework.

The Internet of Things (IoT) is the “network of interconnected sensor-equipped electronic devices that collect data, communicate with each other, and can be monitored or controlled remotely over the Internet” (Ahrens, “Making Sense of The Internet of Things”). Everything around us is pleasing with increasingly interconnected through technology. Today's, Sensors (such as iBeacons) can be placed onto almost anything which can connect any number of devices composed in some very powerful and innovative ways.

Contextualizing IoT with Business Impact

The prominence lies in IoT's development is to connect the physical world and the environment to the Internet or to wireless networks, this would allow making objects, machines and work environments interactive. By using sensors, objects will be capable of exchanging data with other machines without the need of human intervention (Heires, “Preparing for the Internet of Things”). The IoT has the flexibility and capability to include different technology infrastructure, devices and services such as the cloud, computing, data analytics and mobile communications. Because of this special feature IoT is for sure a trend that takes the development of interconnectivity to another level, one that once was only imaginable in spite of many platforms and discoveries with rich wage of complexity, ease of adaptability, global reach and novelty.

The IoT is a plausible trend that is moving forward, rapidly and estimated that by 2020, 50 billion devices around the world will be connected to the Internet. “A third of them will be computers, smartphones, tablets and TVs... The remaining two-thirds will be other kinds of things: sensors, actuators, and newly invented intelligent devices that monitor, control, analyze, and optimize our world (Burkitt, “A Strategist's Guide to the Internet of Things”).

There will be a gigantic varieties of interconnected sensor systems and products that the IoT will enable, from simple monitoring of home temperature and security to the quantified self ... to fully networked factories and hospitals, to automated cities”. (Burkitt, “A Strategist's Guide to the Internet of Things”). While it observed that the IoT has the capability to drive a major shift in the economy, politics and regulations from all government agencies, companies, and non-profit organizations, this paper will only focus on the effectively integrate the information silos to attract the right customer with better value propositions.

We are in the early junctures in the creation of an Internet of Things. IOT can be revolutionary when we link the necessities in well-thought-out way using the suitable technological tools sensors, actuators, and networked intelligence are combined.

Here is the examples provided by the GE on industrial applications for smart machines below where they say with efficiency gains for systems of just 1% could result in 15 year savings of:

What if... Potential Performance Gains in Key Sectors			
Industry	Segment	Type of Savings	Estimated Value Over 15 Years <small>(Billion nominal US dollars)</small>
Aviation	Commercial	1% Fuel Savings	\$30B
Power	Gas-fired Generation	1% Fuel Savings	\$66B
Healthcare	System-wide	1% Reduction in System Inefficiency	\$63B
Rail	Freight	1% Reduction in System Inefficiency	\$27B
Oil & Gas	Exploration & Development	1% Reduction in Capital Expenditures	\$90B

Note: Illustrative examples based on potential one percent savings applied across specific global industry sectors.
Source: GE estimates

Figure 1: Potential Performance of Sectors. Source: GE Estimates

IoT Technology and Business Applications:

The IoT has shown few significant developments for the consumer, there are nearly endless combinations of applications. As an example, is there any logic in giving an alarm to the owner when there is a fire in your home, instead of talking to your home appliances like gas appliances to shut them off and ensuring an alert sent to owner household's phones with fire station?

There are voluminous research happening around for last few years on applications of IoT. The following Fig:1.2 indicates few application areas of IoT.

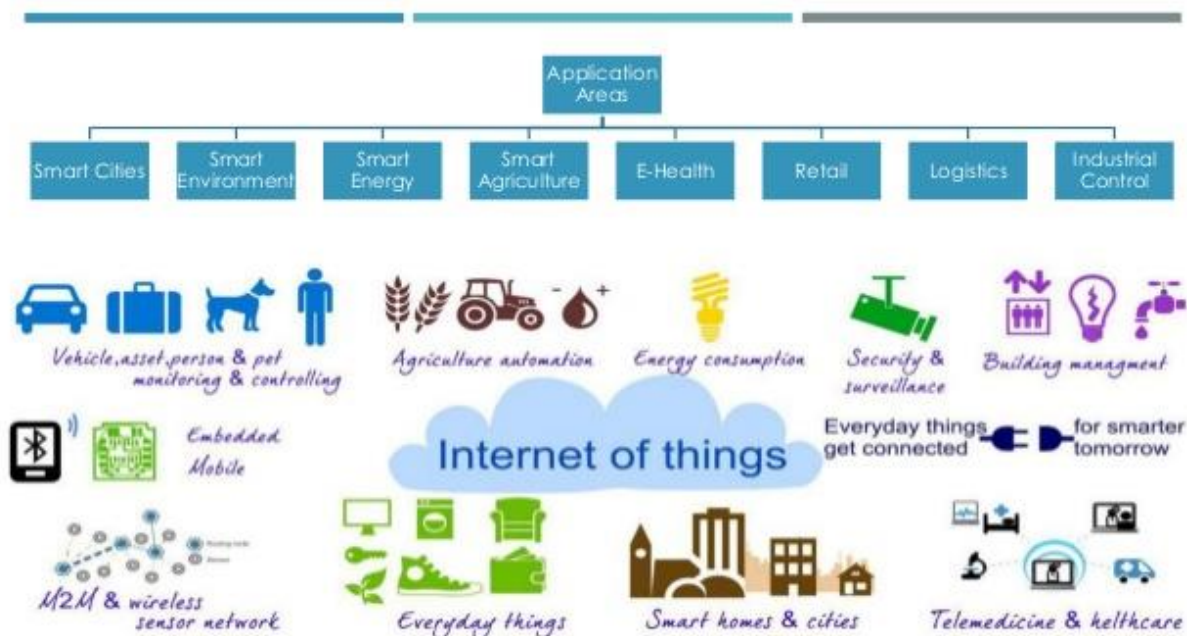


Figure 2 : IoT Application Areas. Source: Google.

Since 1960's industries following the technology but today's business looks at the "Sharing Economy" where they look at mutually benefit, either customer or supplier. Technology has changed the way the businesses looks at their services and competition. According to Bill gates "Technology compasses every industry to competing with time rather their own rivals in the field"

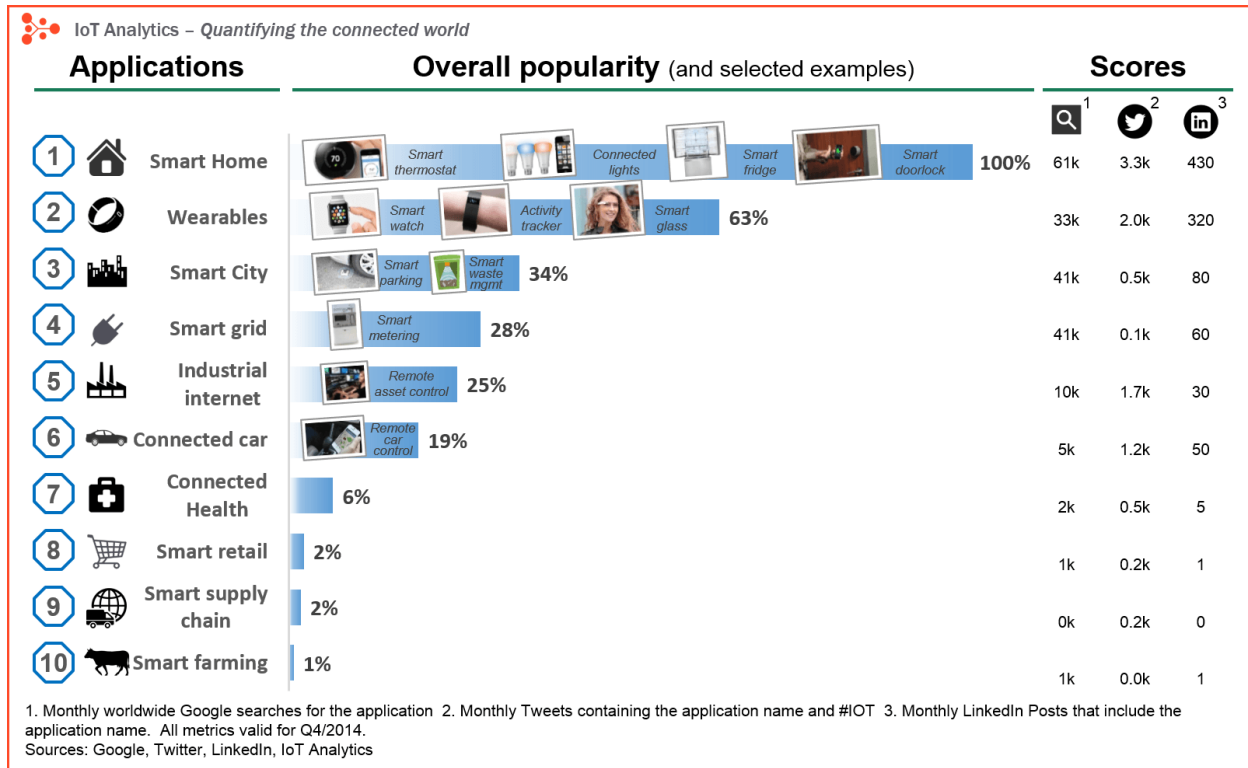


Figure 3: IoT Application Areas with Popularity Metrics. Source: Google

There are enormous devices that exist to offer a smart home. Like smart TV, Air Conditions, Doors, Cookwares. For example, a washing machine is able to self-diagnose problems and notify the manufacturer when its part needs a replacement, the contact centre is then able to make a call to the customer to notify them and fix the device before a more serious problem can occur, significantly improving the customer experience.

The proposed model concentrates on providing an eco-sharing environment for organizations and consumers in Smart Retail, connected cars for the study. There are ample experiments and studies are happening in around the world. The seemingly foreseeable convergence of the corporeal world with the IoT technology will provide us the power to virtually connect all our objects and devices through sensors, network connectivity as well as software which would make it possible for these devices to transmit information and data among one another.

One of the top peculiar features of IoT is that staying connected, it will mark the technology a more powerful tool for consumers, this in turn flag for increased customer engagement and enhanced customer satisfaction.

Gartner research (2015) have predicted by 2018 there will be 5% of customer service cases will be autonomously initiated by connected devices as more objects connect to the internet. This is supported by Nicola Millard, Head of Futures and Insight at BT, "I think a lot of the technologies we are starting to see

Won-Pyo Hong, Chief Marketing Officer at Samsung

"The most important principle of the Internet of Things for Samsung has to be that it's not driven by technology, but by people's expectations. It has to be an IoT for you. Only then can it naturally blend into other parts of our lives,"

like the Internet of Things could be used more proactively with the contact centre so it becomes more in-charge of demand rather than just responding passively to it.”

Key Integrators for IoT:

IoT *is* within reach for retailers but needs an appropriate technological groundwork. Three key components to your connected strategic model include a converged platform, business intelligence, and smart devices.

There are three integrators of IoT which creates successful and seamless integration

1. Converged Platform

This is the base for IoT and is a converged platform like Retail Pro® retail management software. This software connects the data from all your devices and retail tools – like mPOS, eCommerce, integrations to Amazon and other digital marketplaces, shipping tools, loyalty applications, etc. – in one platform. A converged platform permits information-sharing between devices, giving you a comprehensive depiction of customer and operational activity athwart channels and enabling process automation.

2. Business Intelligence

Once you devise a converged platform that amalgamates all your data, you will need business intelligence software to help you make perfect sense of the data and acting on it in maturely which is generate from your connected devices. Having a design for data analysis is critical, as “90% of the data generated by smart-connected devices is never analyzed or used for anything, and 60% of it begins to lose value just milliseconds after it is generated,” according to IBM.

On the other side, devices are not inherently smart and data is not inherently useful, so still requires the human mind coupled with business intelligence software to direct device placement in your stores and to drive operations optimization and conversion.

3. Smart Devices

Selection of the IoT devices for your strategy will depend on the way you want to accomplish for your stores. Here are major 3 tools used in retail today:

RFID for inventory accuracy and customer engagement in-stores: Almost a decade now RFID providing significant performance and benchmarks in almost every field. Here is a matured infrastructure case of American Apparel, which uses item-level RFID for inventory management with Retail Pro. Some of the features are running daily reports to realize what’s trending, what is in-stock, need to replenish in display, missing and, and which stores are careworn or need to cycle count. Complete reflectivity into their inventory enables greater competence and ensures products are available when and where they are wanted.

There is another upright example - Burberry, it implemented RFID tags to measure and take the customer experience to the next level: the RFID tags activate smart mirrors to run video footage of the clothing item’s creation and features with the reason while the consumer is there in the changing room. This considerate of right engagement and draws customers into the story behind each piece and hearths a stronger connection with the brand.

Beacons and personalized marketing: In the recent years Beacons are made its mark in retail with its ability to sense. Hamleys, Armani, Longchamp, and Hackett are the few brands leverage beacons in their Regent Street stores in London to personalize their mobile marketing strategies. The beacons target passersby who have opted in for messaging through the Regent Street App and drop timely, relevant communications about discounts, in-store promotions, and exclusive events and products directly to shoppers’ smartphones.

Google's Eddystone supporting these industries by providing beacons which open URLs in a web browser instead of apps. This can increase the potential pool of shoppers willing to receive these personalized marketing messages by decreasing commitment levels required of consumers (as with downloading an app).

Vendor drop ship: Massey's Outfitters, Retail Pro platform integrated with a vendor dropship and eCommerce application to the inventory. This seamless connection permits the small stores to rebalance their goods with each other for a leaner inventory and fulfill orders directly from vendors when goods are about to exhaust or not available in stores.

A model for Smart Retail:

The Internet of Things (IoT) is generating much buzz in consumer circles and in retail at its core, with its capability - a network of connected devices sharing data to increase efficiency by optimizing and automating (where possible) your decision making, workflows, queues, staffing, and inventory management processes – as the means for increasing conversion in your retail stores.

“Gaining new customers along the way should remain on any business owner's to-do-list – but if you treat all customers in way that makes them want to return, merchants are more likely to gain long-term success” said by Nicole Leinbach-Reyhle, a retail expert. She proposed a three strategies to Attract Repeat Customers (Forbes, 2014) are Employee Engagement, Customer Value, Product knowledge.

There are many instances of information silos even after two decades of retail and its innovative technologies trying to bond consumers. On the other side, consumer also more rapidly attracting to the innovative approaches in Omni channel retail.

The In-store Experience of Tomorrow

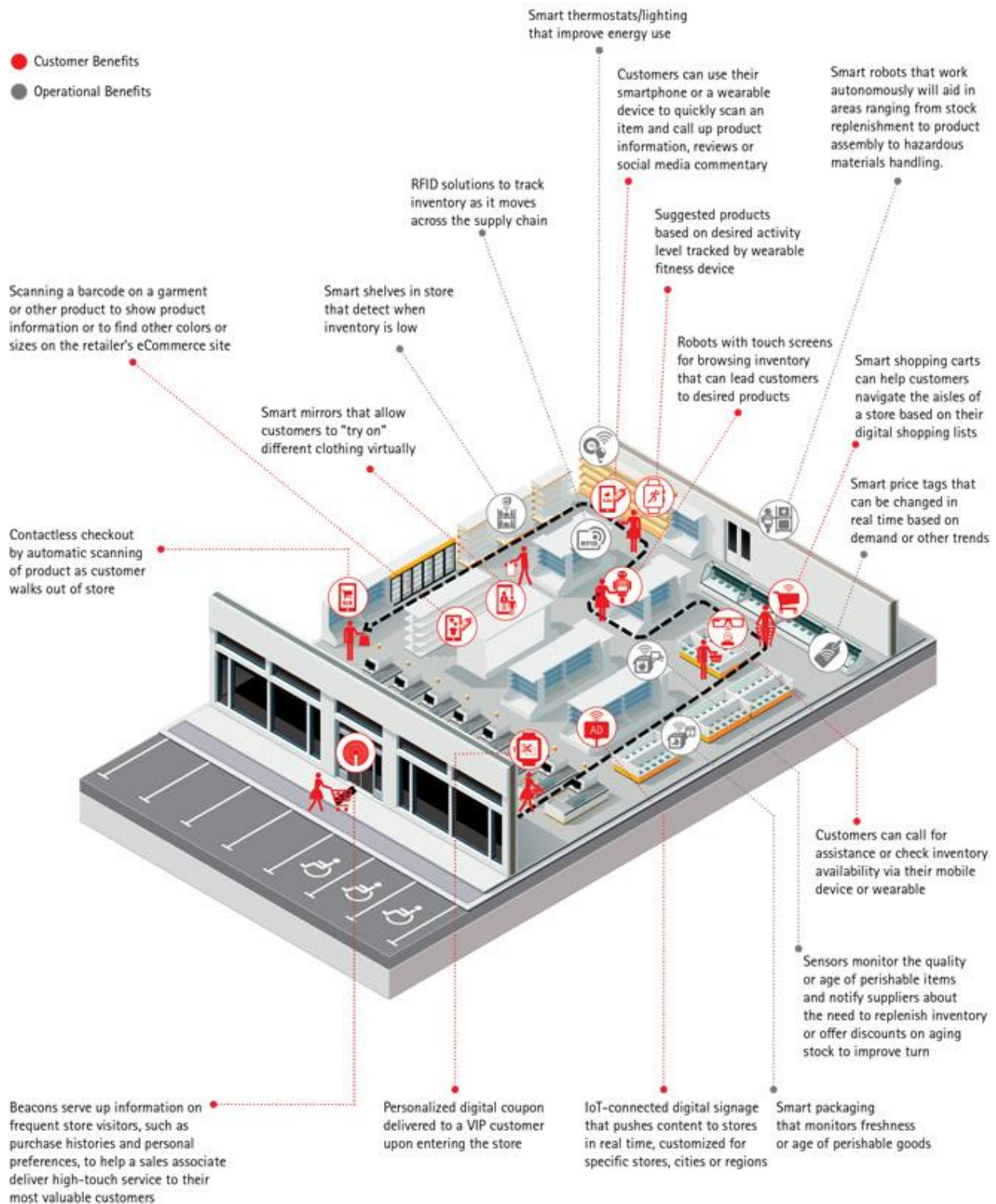


Figure 4: Future Retail Source: Accenture

Here is a make-believe situation to understand the model. Consumer while driving on the road, car gives him an alert message about availability or offer on the product which he was browsing few hours ago on his laptop. Now look at coordinated systems working in behind to provide right information to the right consumer in right time. This is made possible by connected devices. Not only faster communication of devices, also back support systems need to be in place for comprehensive success.

Consumer demand for convenience, product availability, and both personalized and contextualized interactions will drive retailers to adopt multiple IoT technologies in the coming years.



There are huge efficiencies to be gained when devices and data can collect, present and use real-time information in meaningful, actionable ways. Retailers grow more nimble because the information and insights they need are readily available.

Here we are five definitive ways companies can use sensors to create mutual benefit for both brand and consumer through the intact customer journey. They are:

- **Reward:** through promotion, gamification and entertainment
- **Information & Decision-Making:** for shopping/evaluation, as well as navigation, monitoring, and news
- **Facilitation:** to enable transaction, identity authentication, conversion, and interaction
- **Service:** for proactive and reactive customer support, as well as sales and retention
- **Innovation:** to drive feedback, customization and rapid product

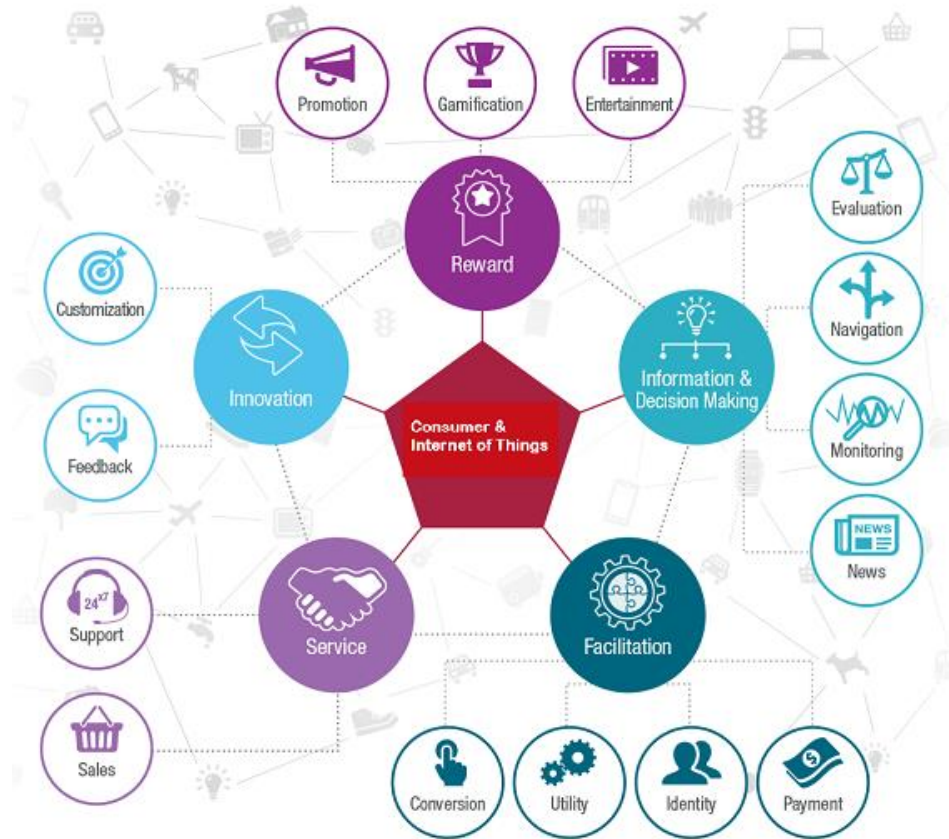


Figure 5: IoT and Consumer Engage Model

1. REWARD CONSUMERS FOR THEIR TIME, MONEY, EFFORT, AND ENGAGEMENT

"78% of consumers said they'd be more likely to purchase from a retailer again if its offers were targeted to their interests, wants or needs.

86% said they'd be willing to pay up to 25% more for a better experience."

Infosys, 2014

The Internet of Things presents a host of new ways brands can reward customers and prospects by leveraging sensors in smartphones, wearables, beacons, and other devices. "Getting customers into your store is the

Examples of IoT-Enabled Reward

Since June 2014, Walgreens has been piloting an augmented reality mobile app that is part gamified product finder, part discount program, and part loyalty program. As shoppers walk down the aisle, they receive a notification informing them of a discount in the laundry section or loyalty points in grocery. "We're now turning the utility into an immersive game-like experience inside the store," says Nathan Pettyjohn, CEO of Aisle411, the in-store mapping technology partner, "The thought is 'Hey, we can encourage you to discover more products and build a bigger basket.'"



physical equivalent of a Google click,” says Alexis Rask, CRO of in-store loyalty Shopkick. “Consumers love to be rewarded, and retailers love foot traffic.”

Reward enabled by sensors incentivizes engagement and purchase by drawing from contextual elements. These elements combine both digital (e.g., online browsing and purchase histories) and physical (e.g., location, time, weather, product) realms. These contextual elements are what differentiate sensor-based reward (e.g., promotion, gamification, entertainment) from traditional advertising and loyalty programs. After all, reward at just the right moment is more effective than randomly broadcasting promotion.

2: INFORMATION AND DECISION MAKING - EMPOWER CONSUMERS WITH THE ABILITY TO ACCESS AND ACT ON INTELLIGENCE

Companies will send the content that they’ve created for the online on to connected devices and in response to such triggers as location, weather, and merchandise interaction. Examples would possibly embrace checklists, comparison guides, and ratings and reviews from alternative customers. As retailers struggle with showrooming for competitive e-retailers, the power to bring the access to info that shoppers have on-line into the offline world is essential for driving purchases in-store. Location-based aid, generally delivered as navigation or wayfinding. This is often info provided to customers to assist in locating product, supported the user’s relative proximity to the merchandise. Location services area unit one value-add several corporations have already deployed in their mobile apps (e.g., “Find the closest store”), however through alternative sensors, like beacons, QR codes, and NFC and RFID tags, corporations will guide customers not simply to the closest store however on to the product most relevant to them.

Monitoring capabilities intercalary to things individuals care regarding. Through sensors, corporations will alter observation (read: visibility) into regarding something, like the amount of steps taken per day, the number of food the dog is feeding, and therefore the quantity of windshield-wiper fluid remaining. Any connected object will inherently be monitored, and types will use this insight to supply additional price by delivering additional potency to customers, whether or not within the sort of energy, time, insight, or money. “Interestingly for brands, this will be terribly in person impactful,” says Charlie Isaacs, CTO of Salesforce, like “monitoring a sick honey

Examples of IoT-Enabled Information & Decision Making

The Sampler mobile app from shoe brand Converse uses augmented reality (AR) to allow shoppers to try on any shoe in the mobile app virtually by simply pointing the phone’s camera at their foot. Shoppers can post to social media channels to solicit their friends’ opinions and even purchase directly from the app. Other retailers, including IKEA, CoverGirl, LEGO, Burberry, De Beers, and American Apparel, are also leveraging AR for this use case.



IoT-Enabled Facilitation :

Disney’s proprietary wearable, MagicBand, serves as a wrist-worn identity portal for guests, streamlining authentication across numerous aspects of the parkgoer’s experience. Once guests register their personal information, the wearable serves as room key, building key, admissions pass, parking lot entry, store and restaurant payment mechanism, and more.¹⁴

or understanding the importance of observation those machines that area unit providing medical aid to our sick preciousness.” Device makers could have knowledge that, once collective, provides distinctive empirical insight into a scenario. within the wake of the recent cruciferous plant, California, earthquake, wearable fitness huntsman company Jawbone free associate collective report of however the earthquake affected point of entry Bay space sleep cycles, supported sleepers’ proximity to the quake’s epicenter.

3: FACILITATION

FOSTER EASIER, MORE ACCESSIBLE, AND CONVENIENT BRAND EXPERIENCES

Facilitation in IoT is essentially about enabling consumers to do, accomplish an exploit more seamlessly through the use of connected devices. It’s about streamlining transaction, authentication, or any other exchange between brand and consumer.

IoT is shifting however brands alter client expertise via the payment method. Financial transactions may be ironed through mobile pocketbook, mobile payment (smartphone or wearable), in-app dealings functions, NFC readers, identity authentication, QR codes, or the other sensor-enabled manner of digitally exchanging cash for merchandise or services.

Identity of the patron and authentication through detector information facilitates quicker validation or admission method. Corporations are operating to contour the method of firmly authenticating identity supported shopper identifiers aggregate from multiple information sources (e.g., in person diagnosable data, monetary information, product usage information, biometric information, social data). Even as social login will ease identity authentication across apps and websites, therefore can also differing kinds of detector information across connected objects and environments. This unification and attribution of knowledge is important for weaving along the assorted product, services, associated content comprising an individual’s distinctive context.

IoT expands conversion capabilities. Client conversion is outlined as any preset event designed to trace or move customers through the acquisition funnel. Marketers are well familiar with conversion on-line and its importance in activity through events like registrations, requests for downloads, reservations, and access to content. Samples of sensor-based conversions will embrace, however don't seem to be restricted to, location-based activities, like coming into a store, domicile in an exceedingly sure department for an explicit quantity of your time, and redeeming a

promotion and connected product-based activities, like requests for service, troubleshooting data,



Starbucks now makes transactions possible beyond the Starbucks app through third-party integrations (extending beyond smartphones) with wearable devices such as Microsoft Band, Samsung's Galaxy Gear, and Pebble. By integrating with PebbleBucks, Pebble's native payment app, for instance, Starbucks customers are able to pay for their beverages via the wearable.

and integration redemption.

4: SERVICE - SUPPORT AND RETAIN CUSTOMERS BY PROACTIVELY IDENTIFYING OPPORTUNITIES

Today's customers don't need to wear down product and connected service issues; they merely need product and services to figure seamlessly. In IoT, Service is concerning distinguishing gaps, issues, or opportunities to either react in real time or proactively recommend, service, or resolve before customers notice they need a drag. Service in IoT may be each reactive and proactive.

- **Reactive** service is associate extension of support as we all know it nowadays, wherever shopper agency drives interaction. Customers chatting or tweeting to a complete or career a call center are samples of such agency nowadays. 2 samples of sensor-enabled extensions of reactive support embrace Amazon's distress call button and troubleshooting a sensible white goods through live chat.
- **Proactive** support is once service converges with automatic resolution. Typically this is often invisible to the client. For instance, a connected washer isn't simply blocked into the wall outlet; rather it perpetually sends performance information to the manufacturer. Once one thing goes wrong, the manufacturer will either deliver a software system update over the air or preemptively schedule a technician visit.

The bigger potency in self-service by IoT is increasingly necessary. As seventieth of customers nowadays expect brands to possess a self-service application on the market, whereas four-hundredth like self-service to move with an individual's. IoT conjointly optimizes support across channels and devices, each reactively and proactively. Consider that about half the time of typical service calls are now devoted to customers providing basic information.

These service of IoT also influence sales. As devices acquire client history, purchase history and private preferences over time, they're going to be ready to each react to and predict opportunities for service and, in some cases, sales. Sales within the web of Things will become associate extension of service as a result of it's usually au fait by a similar information. Thus, what IoT offers salespeople is a lot of context, that is, a lot of data from that to tailor electronic communication, suggestions, and solutions. Service-related use cases in IoT are also wherever corporations are presumably to envision impact on very cheap line:

- Increased potency in offer chain management
- Increased potency parturient prices for service agents, field technicians, and therefore the like
- Increased revenue and/or client retention through timely upsells (e.g., preventing product/service malfunction and client frustration)
- Identification of problems in product or service expertise
- Identification of latest business models (e.g., new services, information access, shared services)

The Internet of Things will impact service at each level of the client expertise, like observance product performance, facilitating customer-brand communications, distinguishing dead problems or time period interference, and recognizing sales and extra service opportunities. "This whole market are outlined by however we tend to use information from connected devices to feature price." explains Kevin Meagher, vice-president of good Home at Lowes. "In the longer term, folks won't purchase devices only for their physical attributes; they'll purchase them due to the apps and services that property allows."

Whirlpool's latest connected washer/dryer streamlines the support method therefore once a problem happens, the machine itself hosts a nosology tool that gives straightforward how-to guides and stepwise troubleshooting help to assist resolve common user errors in period.



In January of 2014, Tesla was forced to recall 29,222 Model S cars. The wall chargers were at risk of overheating. Given Tesla cars are effectively hardware supporting a software operating system, Tesla was able to deliver a software update that eliminated the problem in all 29,222 cars. Not only did this save drivers a pesky trip to the dealership, but Tesla gave customers full control over when they preferred to receive the 45 minute update.

5. INNOVATION - EVERAGE FEEDBACK FOR RAPID R&D, CUSTOMIZATION, AND IMPROVEMENT



In IoT, assembling feedback and innovating product and services will turn up additional quickly. It will facilitate corporations confirm areas for improvement and deliver product updates additional expeditiously by:

- Monitoring sensors connected to connected product, environments, or customers
- Facilitating feedback directly from customers
- Leveraging unvarying capabilities of a hardware-software infrastructure through software system updates

IoT permits customization and personalization to assist brands to remain relevant and differentiated. IoT presents the chance to tailor experiences to customers' distinctive preferences, behaviors, and needs. Whether or not through direct solicitation for customer-submitted requests or with additional automatic mechanisms like machine learning or algorithms, connected product, devices, and environments will learn, and even predict client needs over time. "In effect, IoT blows the door off of listening as we all know it today—and it's largely proprietary knowledge," says Marko Mueller, digital VP cluster director at Edelman.

Improvements at the product/service level will happen at the patron level or in combination, across a complete product fleet, service giving, or maybe setting. As brands apply a software system element, associate degree interface that's unvarying and perpetually updated, to product, that successively become hardware, speedy innovation and customization become attainable. 2 samples of exploitation automatic feedback to boost or introduce however larger systems function:

- The energy habits of city-dwelling residents' area unit monitored for areas and times of high consumption, permitting energy to be reallocated as a result.
- A whole optimizes its own offer chain and inventory management workflows.

Brands' need to form additional custom-built experiences isn't simply a possible win for the whole except for relevance-craving customers, too. As property infuses additional and additional product and as corporations act on the information generated from these product and customers, the exchange of value—via dialog, data, crowdsourcing, and product/service development between brands and consumers—has the potential to evolve additional quickly and facilitate agendas align additional quickly

Examples of IoT-enabled Innovation - Tesla Motors, manufacturer of connected cars, not only provides software updates to the car's operating system (OS), but also crowdsources ways to innovate by allowing customers to submit requests for features they would like. (Implementation is, of course, at Tesla's discretion.) Recently a customer submitted a request for a crawl feature: in effect, extremely slow cruise control to ease the driving experience during heavy stop-and-go traffic. Not only did Tesla implement the crawl feature for that customer, but they rolled it out across the entire fleet via a software update.

McDonald's Beacon-Mobile Pilot Rewards, Facilitates, and Offers Feedback Loop while Driving Sales and Intelligence

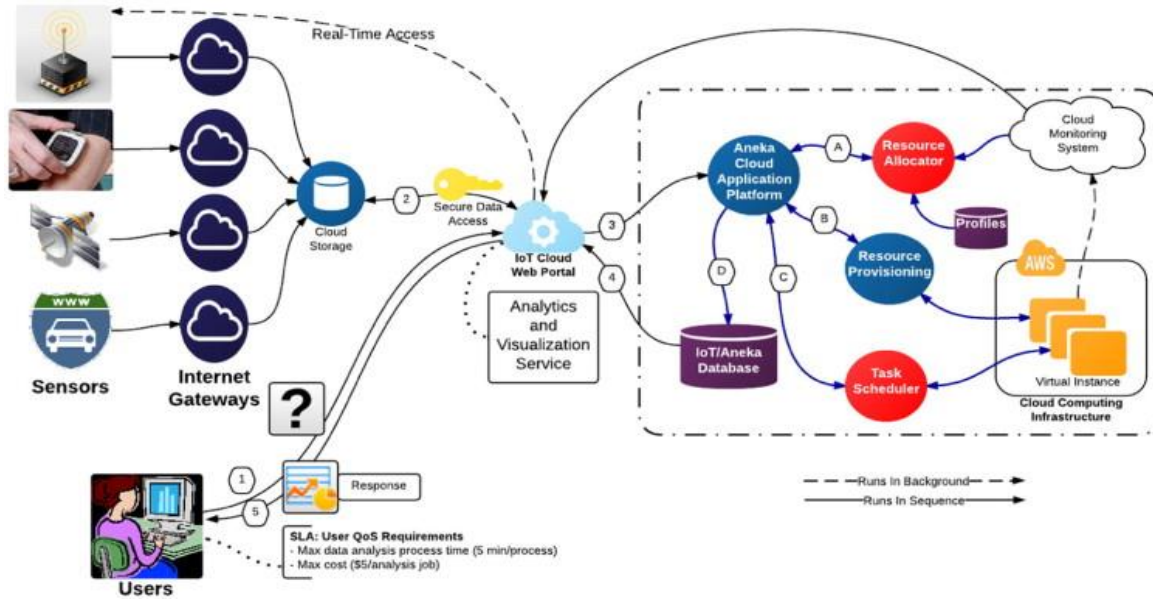
McDonald's recently partnered with Piper, a Bluetooth low-energy (BLE) beacon solution provider, to send customers greetings, coupons, alerts, surveys, Q&As, and even employment opportunities via their smartphones when they walk through the door.²² Customers receive an alert through the Piper app to opt in to take advantage of these offers. Customers can also personalize the content they receive, selecting relevant ads and deselecting those that aren't. 18

McDonald's is, of course, collecting intelligence through data generated in these engagements and through active customer engagement. Customer service issues and inquiries for employment are routed via automated text message directly to the specific manager or other responsible party who can respond before the customer leaves the restaurant.

In the long term, this feedback loop grants McDonald's the ability to improve, even customize, numerous aspects of the customer experience, including facilities, offers, menu items, and recruitment techniques. During the initial four weeks of the launch, McDonald's garnered more than 18,000 coupon redemptions, McChicken sales increased 8%, and McNuggets sales increased 7%.²³

This example illustrates how McDonald's is addressing multiple aspects of its customer journey by leveraging sensors in beacons and mobile devices:

- Awareness: Through reward and information, such as greetings, promotions, and employment opportunities
- Consideration: Through information, such as notifications, surveys, Q&As, and content
- Purchase: Through mobile payment and conversion, as with employment inquiries
- Support: Through service, like rapid response of inquiries
- Loyalty: Through innovation and product, service, and in-store improvement



Impact of Connected Devices in retail can provide impact in multiway to consumer and also industry. The following Fig: 1.6 will create the opportunity for any element of the brand experience to have a voice. When we add sensors to the world around us (e.g., beings, places, objects, environments), we grant these things a voice through the data they generate simply by existing. IoT enables multiway communications between brand and consumer, brand and object, consumer and object, and object and object.⁴ The result is empowerment of each.

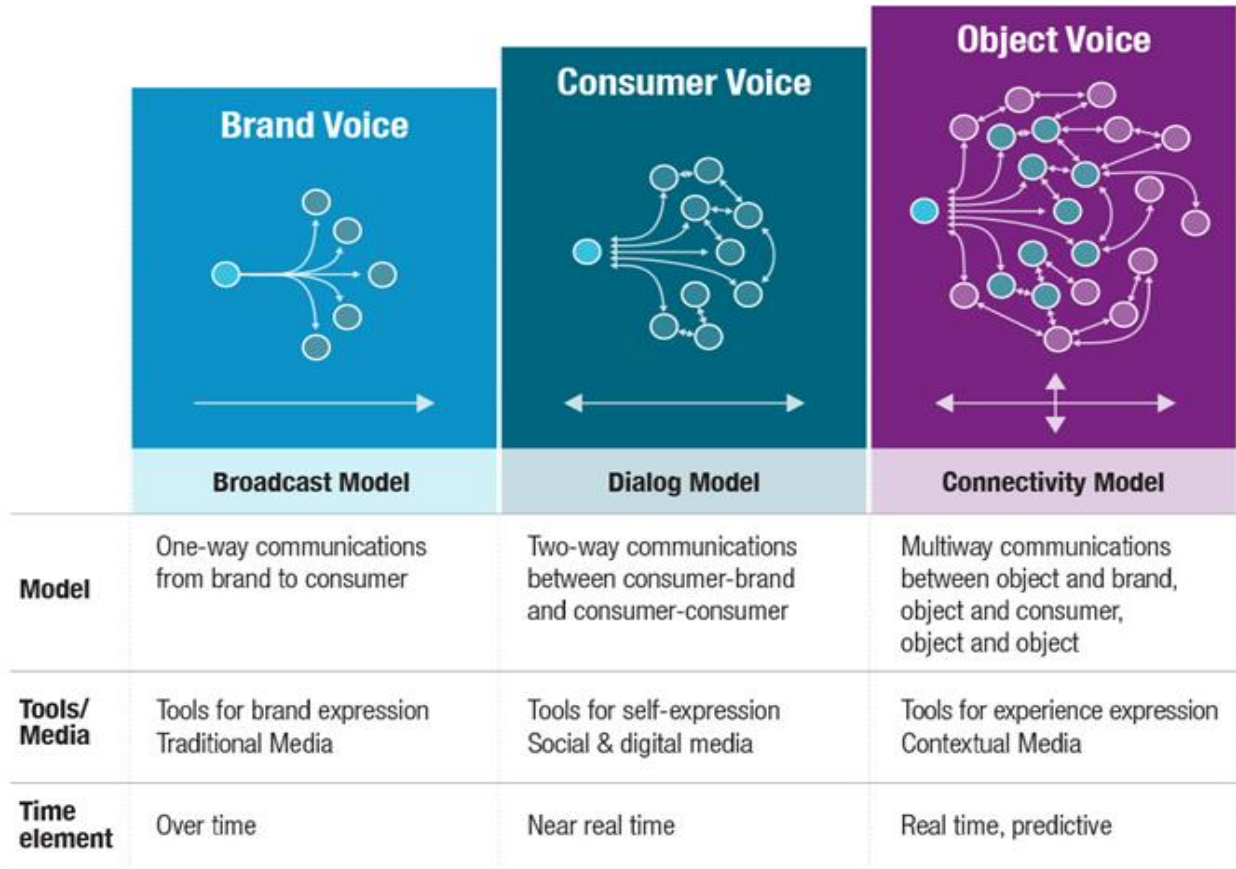


Figure 6: Connectivity Model & Benefits Source: Google

A case of EnGage and its architecture:

ComQi's EnGage is a mature, cloud-based content management platform designed to support smart integration with in-store devices, including those doing digital signage, transactional systems, in-store mobile, beacons, analytics and more. EnGage is already in use by top retail banners globally, including Gap, H&M, McDonald's, and Victoria's Secret.

Built for rapid scale with an extensive API for development and integration, ComQi enables retail technology partners to rapidly extend new services to their customer base without opening costly, time-consuming new development projects.

The EnGage platform reflects more than a decade of research, development and real-world experience. ComQi's first generation platform was among the first in the digital signage industry to introduce and leverage web services, deliver solutions on a software as a service (SaaS) basis, and focus heavily on mission-critical remote device management.

Its roots in data-driven content also trace back more than a decade, applying meta data to all aspects of its workflow, long before the rest of the market.

EnGage Functionality Highlights:

- Measure and control all devices in venue
- Every “thing” is geo-located and searchable
- Bi-directional communication between cloud and devices
- Complete device health and lifecycle management
- Flexible model for capturing data for analytical analysis
- Meeting highest standards of Business Continuity
- Extensive API to support integration
- Advanced reporting
- Layered access and functionality rights set by the retailer

EnGage Platform Technical Overview

EnGage is designed with multiple points of extension and integration. On the server side, the data feed subsystem can pull data from a variety of sources, or have data pushed into it. A hybrid SOAP and REST API provide extensive means to command and control the system.

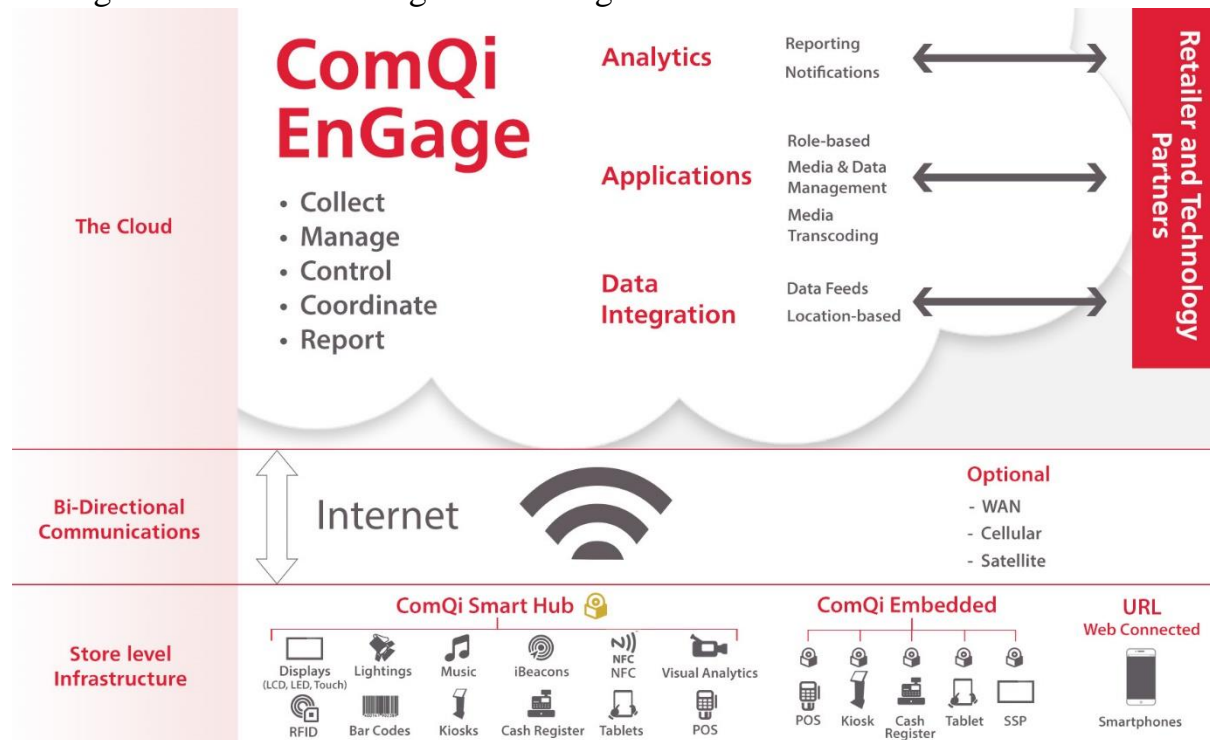
The EnGage Player is a highly extensible and robust end-point. Built using Linux, these rugged, reliable devices act as data integration points, fetching and transforming data from other systems. Via the local player REST API, data and events can be published to the device in real-time. The player’s extensive scheduling and programming capabilities enable it to perform a broad range of playback and control functions within the store.

Out of the box, EnGage supports the following:

- BLE Beacons
- NFC
- RFID
- DMX lighting
- GPIO
- RS232 & TCP panel control
- data access through RESTful push and pull
- streaming video input

Video analytics including gender, age, and interest are optional modules. WiFi and Bluetooth monitoring to detect unique visitors is also supported. Device drivers can also be added to extend the system to provide additional capabilities.

EnGage IoT Platform: Designed for Integration



These use cases address business needs whose results are visible in the near term. IoT is not a panacea, but a tool that can be coupled with traditional approaches to provide retailers with another step forward. These use cases can provide the confidence also bring immediate results for retailers, making the investment for executive teams. As retailers work through early implementations of IoT, they will also play a better groundwork for more ambitious use cases.

Limitations of IoT:

Compatibility: Currently, there is no international standard of compatibility for the tagging and monitoring equipment. I believe this disadvantage is the most easy to overcome. The manufacturing companies of these equipment just need to agree to a standard, such as Bluetooth, USB, etc. This is nothing new or innovative needed.

As with all complex systems, there are more opportunities of failure. With the Internet of Things, failures could sky rocket. For instance, let's say that both you and your spouse each get a message saying that your milk has expired, and both of you stop at a store on your way home, and you both purchase milk. As a result, you and your spouse have purchased twice the amount that you both need. Or maybe a bug in the software ends up automatically ordering a new ink cartridge for your printer each and every hour for a few days, or at least after each power failure, when you only need a single replacement.

Privacy/Security: With all of this IoT data being transmitted, the risk of losing privacy increases. For instance, how well encrypted will the data be kept and transmitted with? Do you want your neighbors or employers to know what medications that you are taking or your financial situation?

Safety: Imagine if a notorious hacker changes your prescription. Or if a store automatically ships you an equivalent product that you are allergic to, or a flavor that you do not like, or a product that is already expired. As a result, safety is ultimately in the hands of the consumer to verify any and all automation. As all the household appliances, industrial machinery, public sector services like water supply and transport, and many other devices all are connected to the Internet, a lot of information is available on it. This information is prone to attack by hackers. It would be very disastrous if private and confidential information is accessed by unauthorized intruders.

Compatibility

As devices from different manufacturers will be interconnected, the issue of compatibility in tagging and monitoring crops up. Although this disadvantage may drop off if all the manufacturers agree to a common standard, even after that, technical issues will persist. Today, we have Bluetooth-enabled devices and compatibility problems exist even in this technology! Compatibility issues may result in people buying appliances from a certain manufacturer, leading to its monopoly in the market.

Complexity

The IoT is a diverse and complex network. Any failure or bugs in the software or hardware will have serious consequences. Even power failure can cause a lot of inconvenience.

Lesser Employment of Menial Staff

The unskilled workers and helpers may end up losing their jobs in the effect of automation of daily activities. This can lead to unemployment issues in the society. This is a problem with the advent of any technology and can be overcome with education. With daily activities getting automated, naturally, there will be fewer requirements of human resources, primarily, workers and less educated staff. This may create Unemployment issue in the society.

Technology Takes Control of Life

Our lives will be increasingly controlled by technology, and will be dependent on it. The younger generation is already addicted to technology for every little thing. We have to decide how much of our daily lives are we willing to mechanize and be controlled by technology.

Scenarios : Imagine a scenario when:

Your fridge can identify that you have run out of milk; it contacts the supermarket and orders the quantity you usually need, and also informs you by sending a message on your phone!

Your alarm rings at 6:30 am; you wake up and switch it off. As soon as you switch off your alarm, it conveys to the geyser to heat water at a temperature you prefer and also the coffee maker starts brewing coffee!

You are on your way while returning home from work and you use an app on your mobile to switch on the lights, the AC in your home, and tune the TV to your favorite channel so that your house is ready to welcome you before you even open your door!

What would really make a refrigerator “smart” would be if it could read tags and alert owners when their food is about to reach their expiry date, for example. Or perhaps it could refer to an online calendar and make orders on a regular basis for certain items to be delivered.

This technology has a lot of applications in various fields. Following are some possible areas where we can leverage the power of the Internet of Things (IoT) to solve day-to-day problems. However, it can be put to many more uses.

CONCLUSION

This paper illustrates the implementation of internet of Things used for observation regular used devices. The outline concerning the integrated spec and therefore the interconnecting mechanisms for reliable measure of parameters by sensible sensors and transmission of information via Internet is given. The framework of the observation system is predicated on combination of pervasive distributed sensing units, system for information gathering, reasoning and context awareness. This paper inspired to develop a system that not solely focuses on the automation side however conjointly on transmission intelligence to the items in IOT.

This paper entitled IOT that signifies intelligent Internet of Things is aimed toward providing knowledge to the objects within the IOT supported cloud to modify them sight any defective in its operating and rectify it with none human intervention thereby creating these objects fully self-directed.

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