

Day 1

Business models in the IoT

Me



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- Developer Advocate at balena.io
- Former co-founder of thethings.io (IoT Platform)
- Co-Founder of the **IoT Barcelona** meetup community and founder of the **IoT Munich** meetup community.
- Co-Founder of the **IoT Stars** (MWC and EW).
- Co-Founder of the **IoT Coffee Talk** and **Els Futurs** podcasts.
- Teacher in the UPC, Zigurat, ISDI and La Salle.
- Working on the AI, IoT, Smart Cities and more since 2005.

Introductions

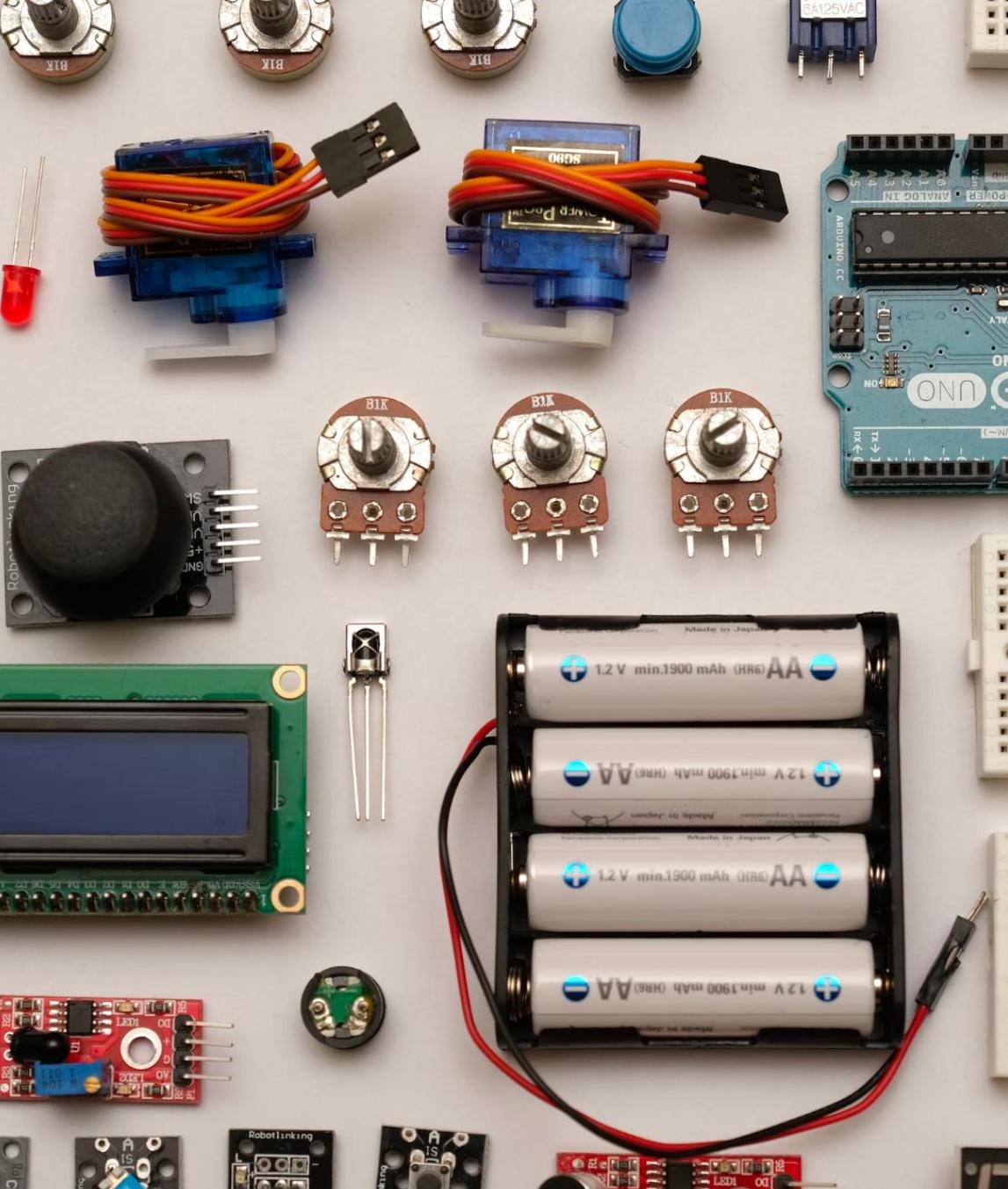
- Your name
- What you do?
- What would you like to do in 5 years?

Introductions

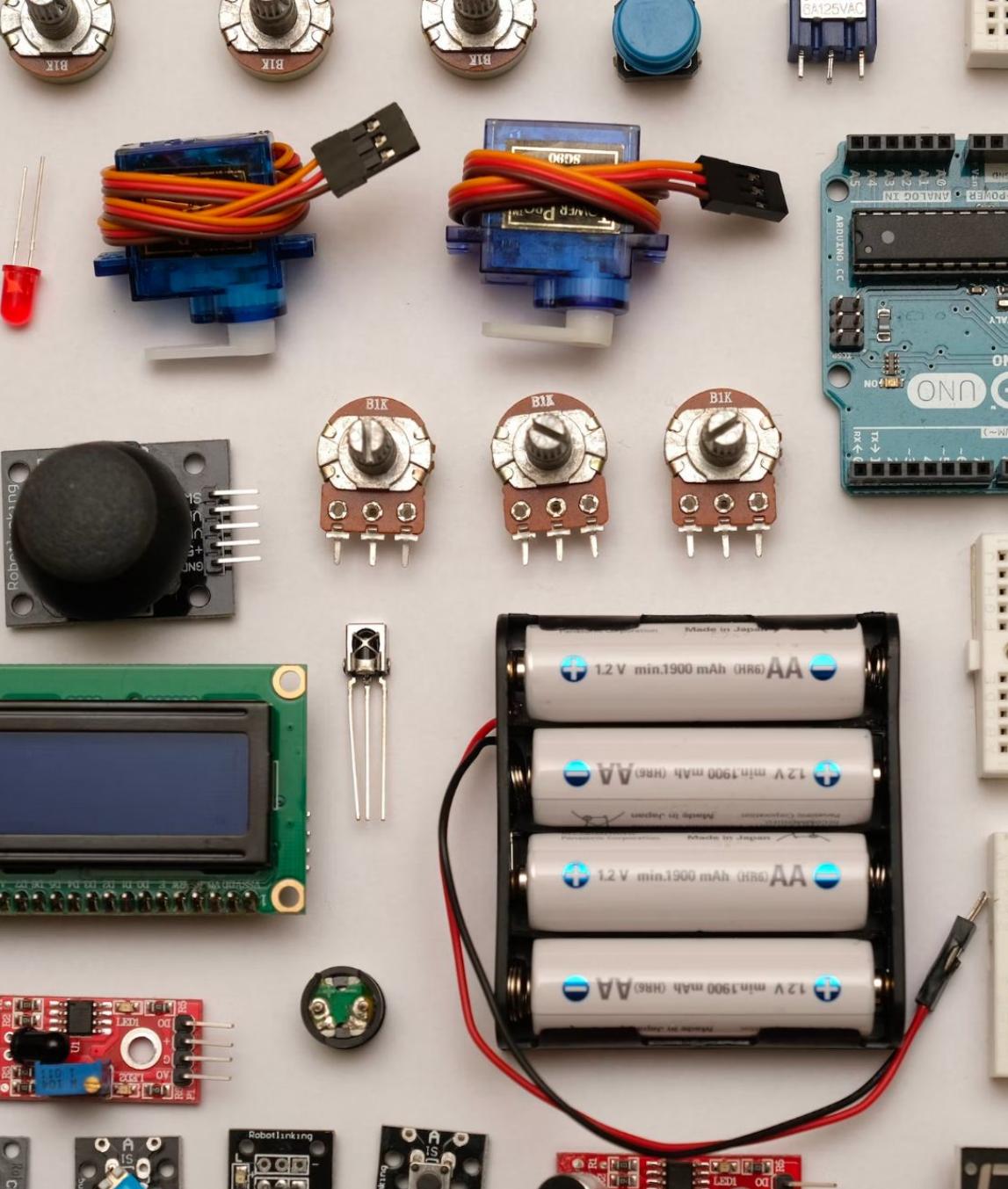
- Your name
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- Projects in the master?

First question ...

What is the Internet of Things?



What is the Internet of Things?



The Internet of Things...



My classes (4)

- Business models and the Internet of Things.
- Business Model Canvas
- How to build your IoT project, digital transformation and more.
- IoT Model Canvas
- Edge Computing, Edge AI and others.
- Let's build a project together
- Examples and demos

Today

- What is the Internet of Things?
- Business models innovation
- New patterns on business models in the IoT

What are the changes introduced by the IoT?

What are the changes introduced by the IoT digitalization?

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- How do we manage the new costs?

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- What should we do with the data generated?
- What is our sales channel for this digital product?
- How do we monetize this digital product?

Frustration with the IoT

- High costs.
- Unclear benefits.
- Business model adaptation.



Challenges ~~Frustration~~ with the IoT

- High costs.
- Unclear benefits.
- Business model adaptation.



What's the cost model of an IoT project?



Source <https://www.disk91.com/2021/cours/iot-slidedeck-2021-07-update/>

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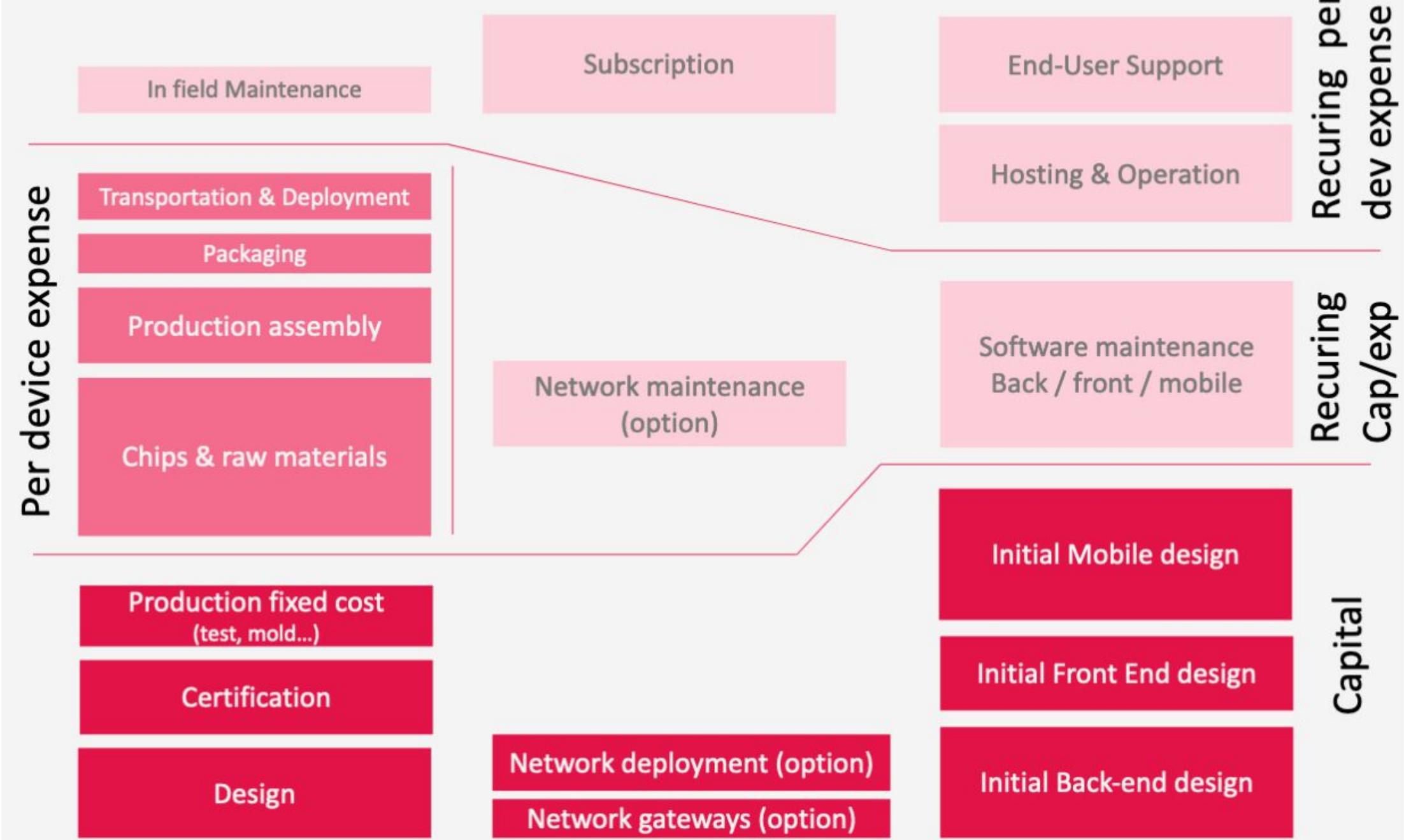
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- Per device costs related to industrialization, production and distribution.
- Recurring costs per connectivity, backend, software maintenance, ...



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- Capital to produce software.
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- Recurring costs per connectivity, backend, software maintenance, ...
- Recurring investment to maintain the software stack.





The IoT solution
business models
differ from the
commodity
product standard

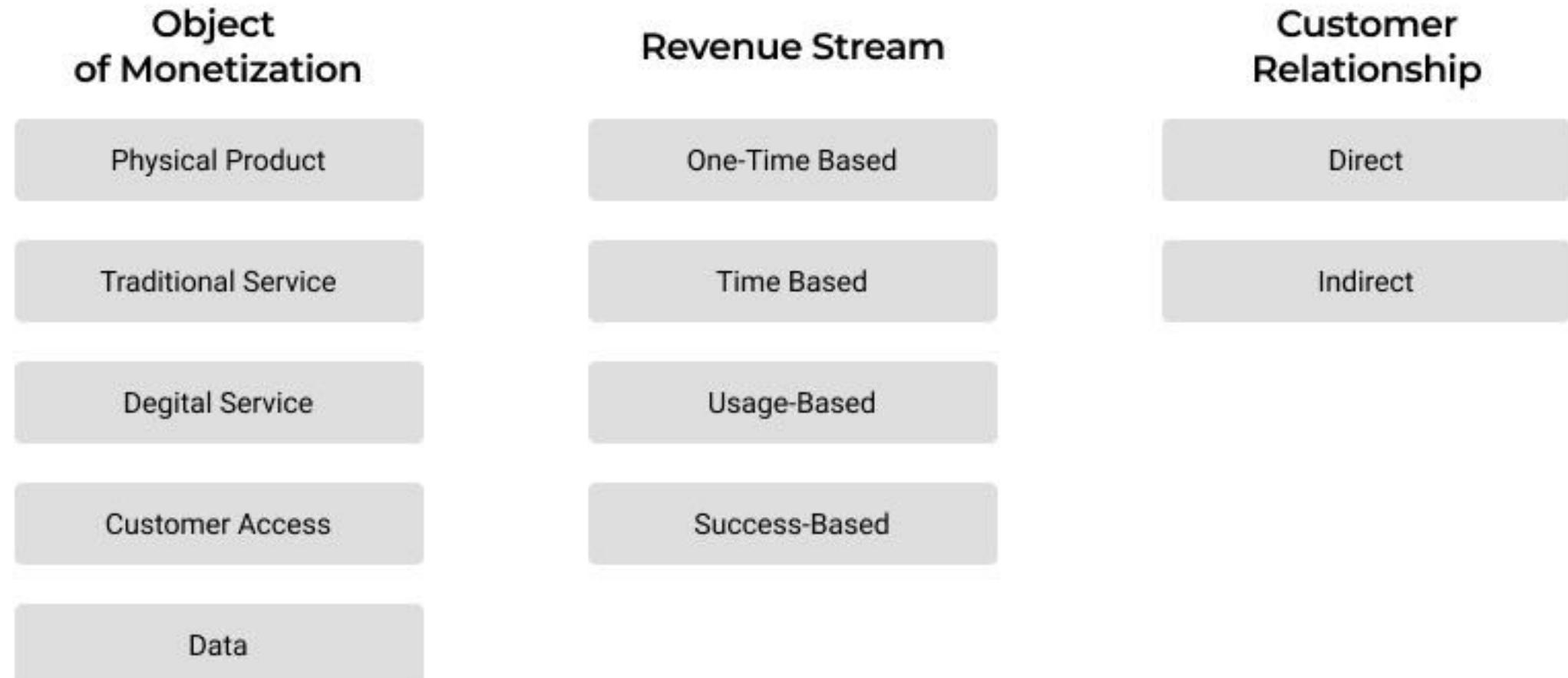


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Total Cost of Ownership



IoT Revenue Model



Source <https://dev.to/softeq/how-to-create-a-viable-iot-business-model-4cn5>

Business models innovation

Let's start with something easy





How is it possible to innovate
in this vertical to make more
money?



How is it possible to innovate
in this vertical to make more
money?

Organic Comfort in Blue: Long-L

✓ Free Shipping ✓ Payment by Invoice

SOCKS UNDERWEAR T-SHIRTS

BLACKSOCKS™ Since 1999

SOCKS

ORGANIC

< >

Subscriptions:

3 deliveries of 3 pairs ⓘ 129,00 €
+ 800 Miles & More Miles Per pair: 14,33

4 deliveries of 3 pairs 167,00 €
+ 1050 Miles & More Miles Per pair: 13,92

1 delivery of 12 pairs (Sockscription extreme) 167,00 €
+ 1050 Miles & More Miles Per pair: 13,92

One-time orders:

Starter kit: 10 pairs 145,00 €
Per pair: 14,50

Trial pack: 3 pairs 45,00 €
Per pair: 15,00

1 trial pair 17,00 €
Per pair: 17,00

ADD TO CART

★★★★★ 4.50 Excellent

http://marcpous.com <https://www.blacksocks.com/en/socks/organic-comfort-socks-blue>

One more...





**If you don't cannibalize yourself,
someone else will.**

Steve Jobs

What is a business model?

A business model describes the rationale of how an organization creates, delivers and captures value.

Osterwalder and Pigneon

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Let's talk about Hilti



Hilti Business Model Canvas

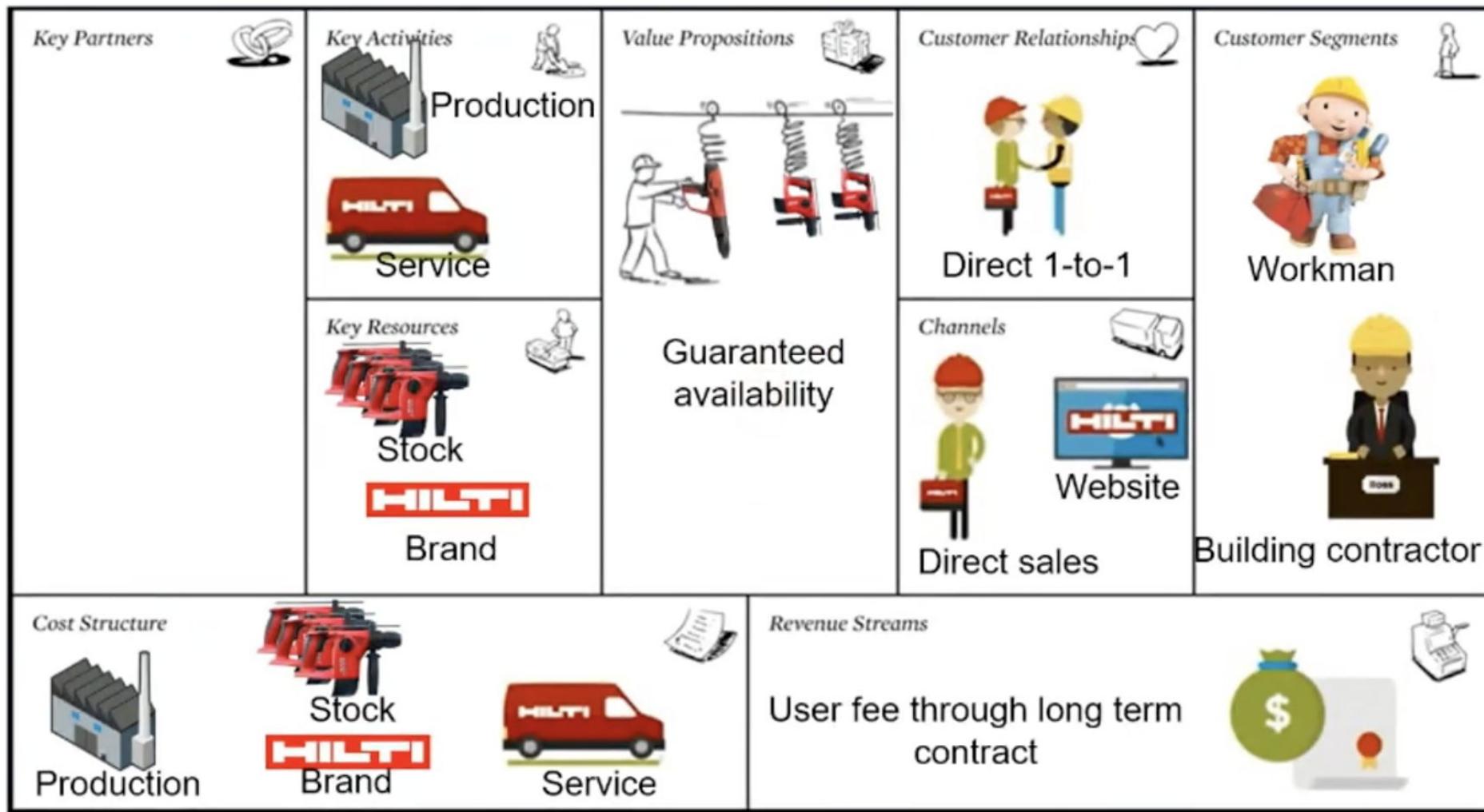


Business models innovation with the IoT

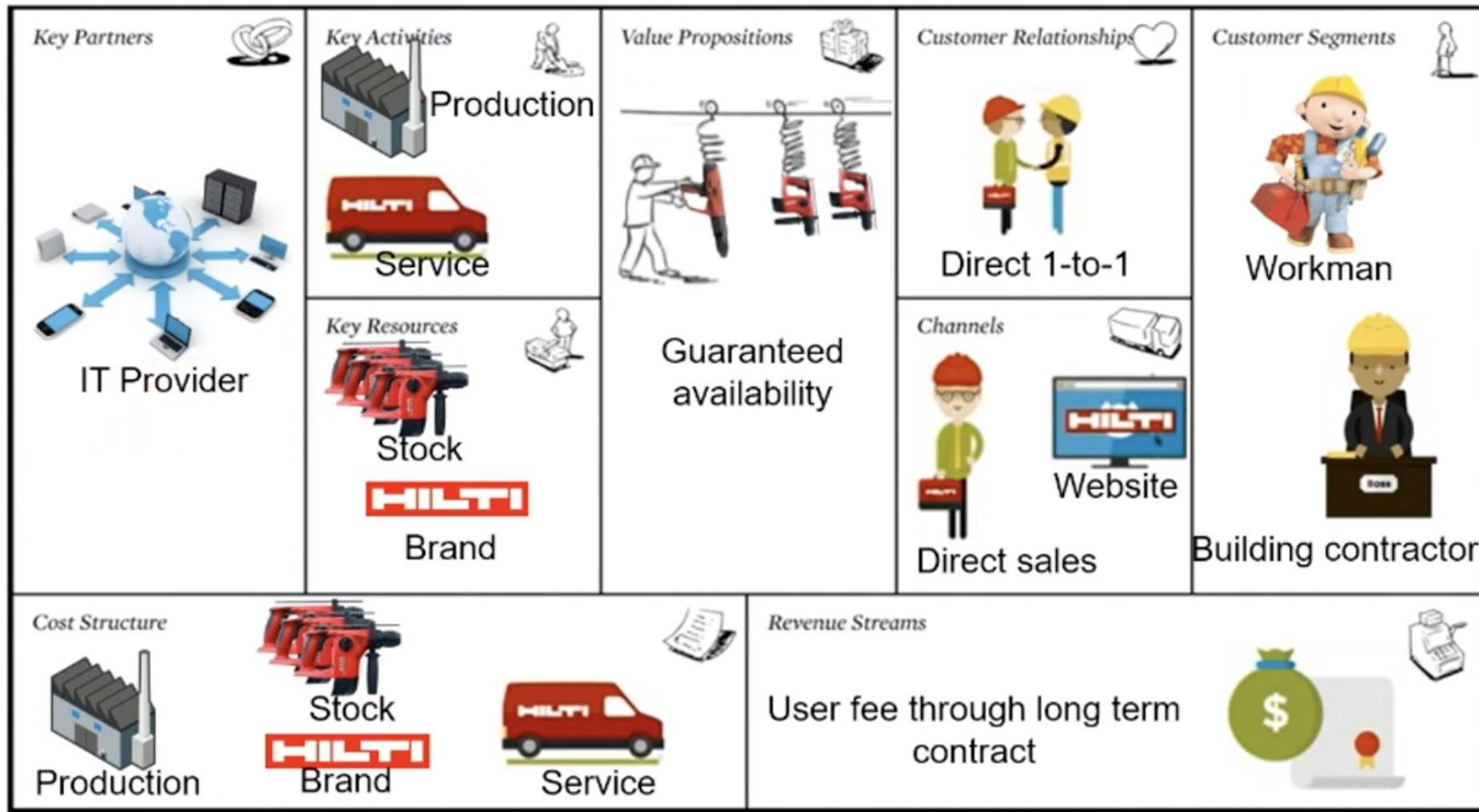
**“People don’t want to buy a
quarter-inch drill. They want a
quarter-inch hole!”**

Theodore Levitt

New Hilti Business Model Canvas

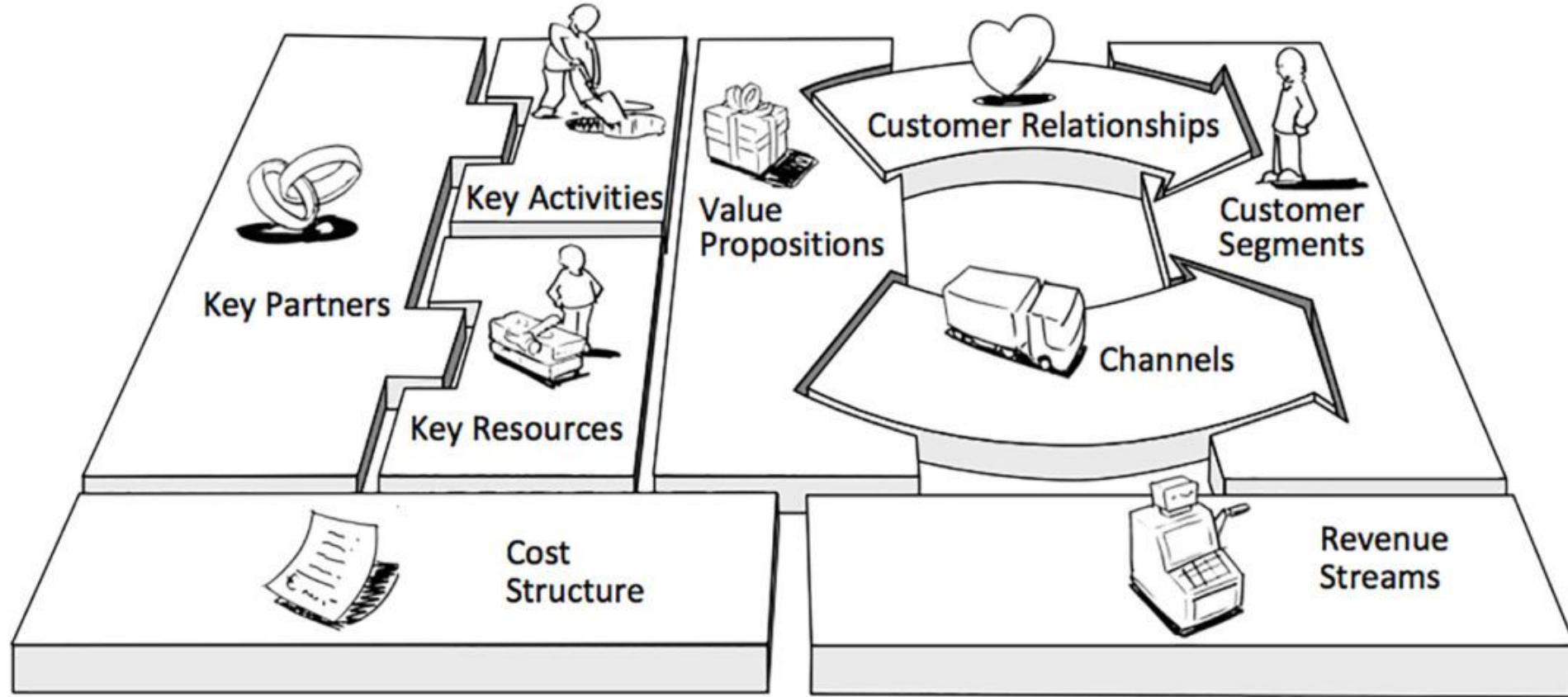


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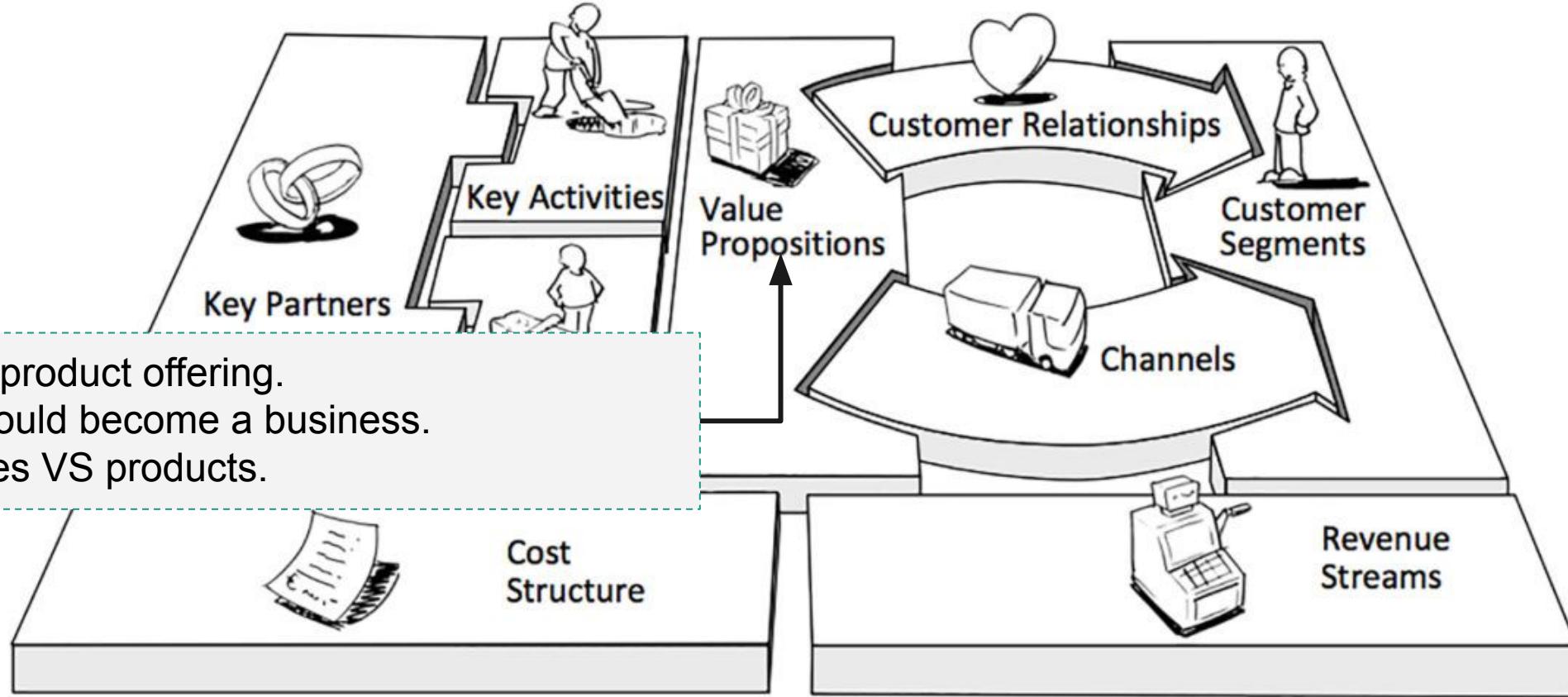


What does change in the Business Model with the IoT?

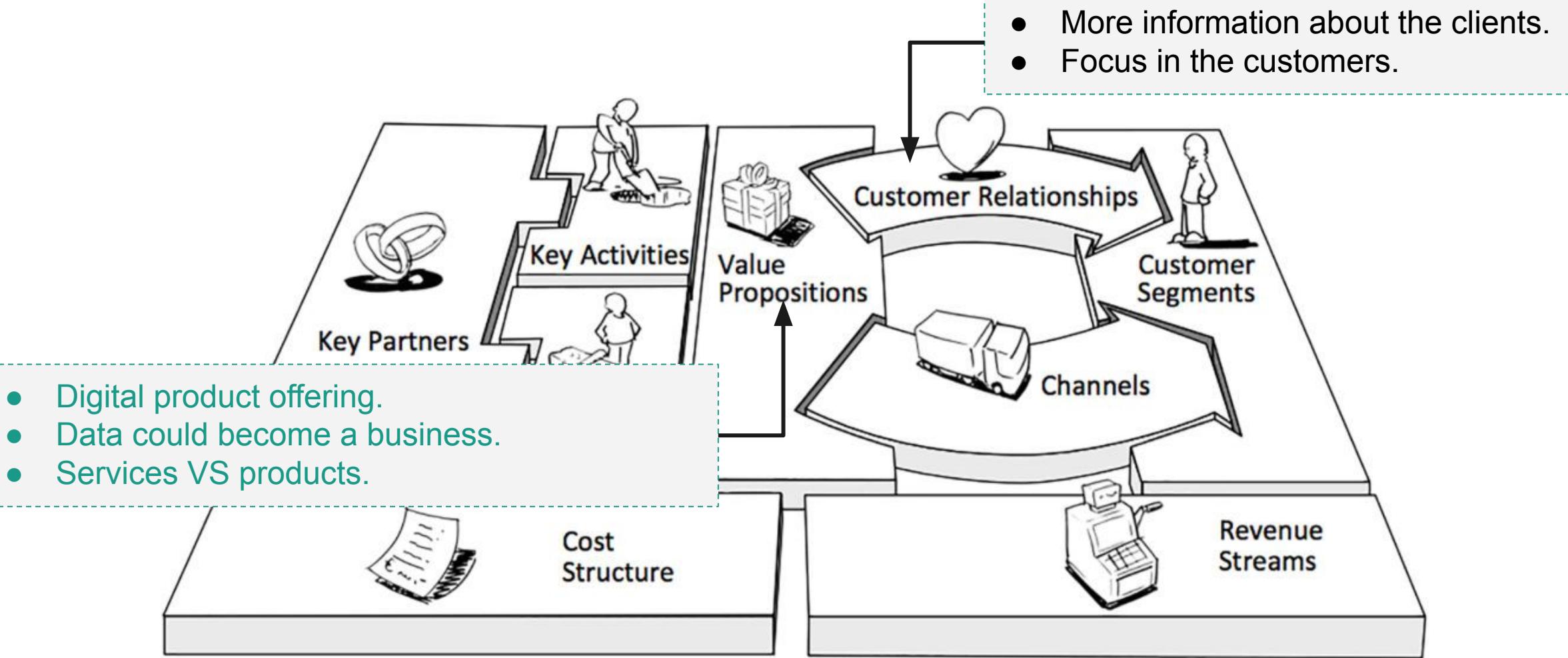
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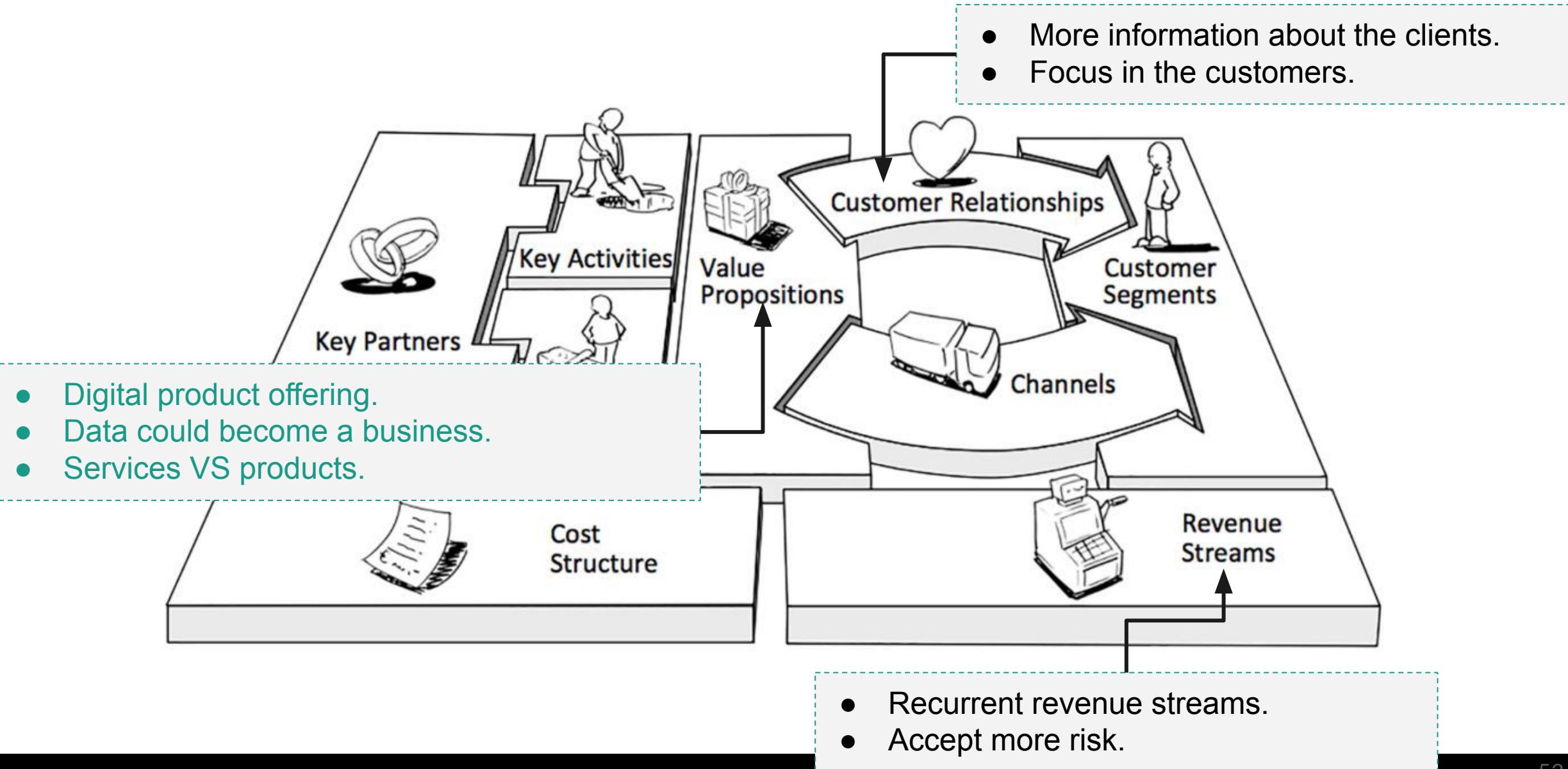
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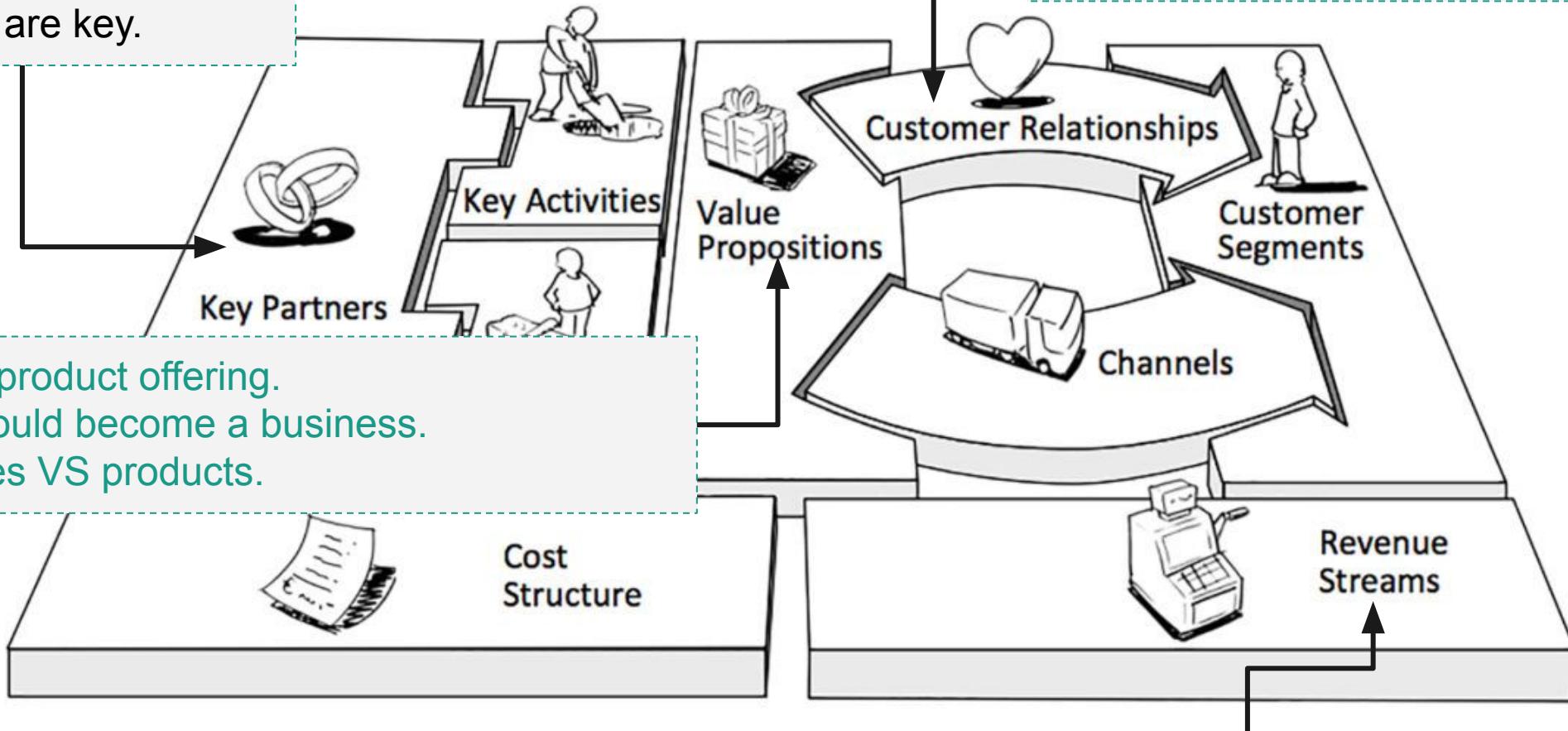


What does change in the Business Model with the IoT?



What does change in the Business Model with the IoT?

- New ecosystems.
- Partners are key.



- More information about the clients.
- Focus in the customers.

- Digital product offering.
- Data could become a business.
- Services VS products.

- Recurrent revenue streams.
- Accept more risk.

New patterns on Business models with the IoT

New? How many?

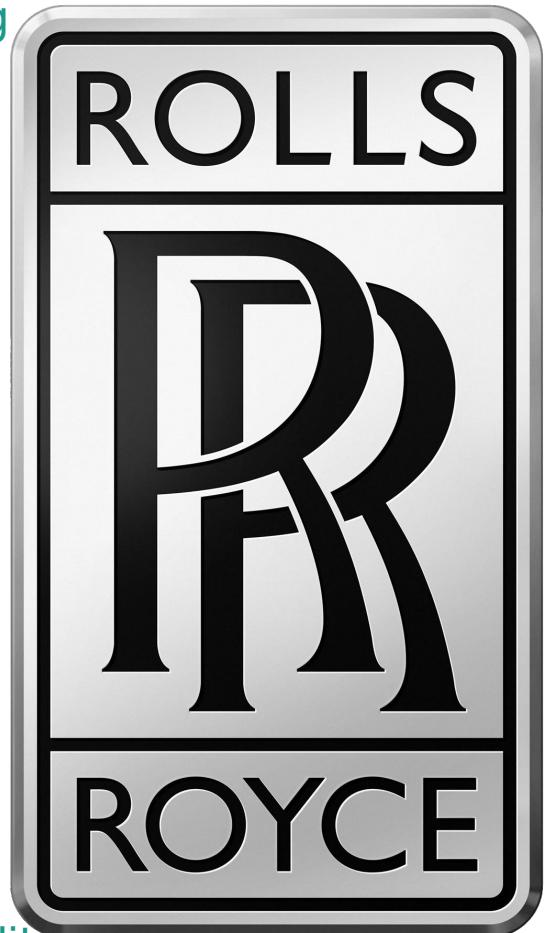
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Affiliation	Ingredient branding	Rent instead of buy
Aikido	Integrator	Revenue sharing
Auction	Layer player	Reverse engineering
Barter	Leverage customer data	Reverse Innovation
Cash Machine	License	Robin Hood
Cross Selling	Lock-in	Self-Service
Crowd-funding	Long tail	Shop-in-Shop
Crowd-sourcing	Make More of it	Solution provider
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From push-to-pull		

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What's next?

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New technologies enable companies to bring innovative products to the market, but applying the wrong business models can make the difference between failing and succeeding.

A business model describes the rationale of how an organization creates, delivers and captures value (Alexander Osterwalder).

- Focuses on capturing and delivering value.
- Leverages the unique characteristic of IoT products having 24/7 connectivity to your customer's environment to produce innovative and differentiated value.

How do you plan to make money with your Master project?

What's your business model?

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Business Model	Add-on
Description	Selling a core product at a base price and offering additional features or services at an extra cost.
Examples	<p>Tesla's Software Upgrades</p> <p>Tesla sells electric vehicles with standard features but offers additional functionalities like enhanced Autopilot, Full Self-Driving capabilities, and performance boosts as paid software add-ons, which can be purchased after the initial sale.</p>

Business Model	Affiliation
Description	Earning commissions by promoting or selling third-party products or services.
Examples	<p>Smart Home Platforms with Affiliate Integrations</p> <p>Platforms like Amazon Alexa and Google Home suggest compatible third-party IoT devices to users. When users purchase these recommended products through affiliated links or voice commands, the platform earns a commission from the sales.</p>

Business Model	Aikido
Description	Turning competitors' strengths into weaknesses by offering a contrasting alternative.
Examples	<p>Fairphone Modular Smartphones</p> <p>Fairphone offers modular smartphones focusing on sustainability and repairability, countering the trend of disposable, non-repairable devices. Their connected products appeal to environmentally conscious consumers seeking longevity over frequent upgrades.</p> 

Business Model	Auction
Description	Selling products or services to the highest bidder.
Examples	eBay's Marketplace for Rare IoT Devices Collectible or limited-edition connected devices, such as first-generation smart gadgets or prototype units, are auctioned on platforms like eBay, allowing sellers to maximize profits based on demand.

Business Model	Barter
Description	Exchanging goods or services without involving money.
Examples	<p><u>IoT Data Marketplaces</u></p> <p>Companies exchange IoT-generated data with each other to enhance their services. For instance, a transportation company might share vehicle sensor data with a city planning department in exchange for traffic pattern analyses, benefiting both parties without monetary transactions.</p> <p>This became more popular with the introduction of crypto (e.g. Helium, Streamr, WeatherXM or Wingbits).</p>

Business Model	Cash Machine
Description	Generating immediate cash flow by requiring customers to pay upfront.
Examples	<p>Pre-Orders for Connected Devices on Indiegogo or Kickstarter</p> <p>Startups launching new IoT products often use crowdfunding platforms like Kickstarter or similar, where customers pay upfront to pre-order devices, providing the company with immediate funds to finance production.</p>

Business Model	Cross Selling
Description	Offering additional products or services to existing customers.
Examples	<u>Fitbit Devices and Premium Services</u> Users who purchase Fitbit wearables are offered premium subscriptions that provide advanced health analytics and personalized insights.

Business Model	Crowd-funding
Description	Raising capital by collecting small amounts from a large number of people.
Examples	<u>Pebble Smartwatch (campaign 2025)</u> <u>Pebble Kickstarter 2012</u> <u>Pebble Kickstarter 2017</u> Pebble launched its connected smartwatch through Kickstarter, securing funds directly from future users excited about the product.

Business Model	Crowd-sourcing
Description	Obtaining input, ideas or services from a large group of people.
Examples	<p>Google's Crowd-Sourced Traffic Data</p> <p>Google Maps collects real-time location data from users' smartphones to crowd-source traffic conditions, enhancing navigation services for all users through aggregated data from connected devices.</p>

Business Model	Customer Loyalty
Description	Encouraging repeat business through rewards or incentives.
Examples	<p><u>Starbucks IoT-Enabled Coffee Machines (2019)</u></p> <p>Starbucks integrates IoT in their machines to personalize customer experiences. The Starbucks app tracks purchases and offers rewards, enhancing customer loyalty.</p>

Business Model	Digitization
Description	Converting physical products or processes into digital formats.
Examples	<p>Smart Locks Replacing Traditional Keys</p> <p>Companies like Ring offer smart locks that digitize physical keys into digital access codes managed via smartphones, enhancing security and convenience through connected technology.</p>

Business Model	Direct Selling
Description	Selling products directly to consumers, bypassing traditional retail channels.
Examples	<u>Tesla Cars</u> Tesla sells its connected cars directly through its website and showrooms, providing over-the-air updates and direct customer engagement without dealerships.

Business Model	E-commerce
Description	Buying and selling goods or services over the internet.
Examples	<u>Ring Security Devices</u> Ring sells connected doorbells and security cameras online, allowing customers to purchase and set up smart home security solutions themselves.

Business Model	Experience Selling
Description	Selling an experience rather than just a product.
Examples	<u>Disney's MagicBand</u> The MagicBand is a connected wristband used in Disney parks to access attractions, make purchases, and personalize experiences, enhancing the overall visit.

Business Model	Flat rate
Description	Charging a single fixed fee for a service, regardless of usage.
Examples	<p>Canary Smart Home Security Subscription</p> <p>Canary offers a connected home security system with a flat-rate monthly subscription, providing users with unlimited video recording and storage without worrying about variable costs based on usage.</p>

Business Model	Fractional Ownership
Description	Sharing ownership of a high-value asset among multiple individuals or entities.
Examples	<p>Timesharing Connected Vacation Homes or Boats</p> <p>Companies like Inspirato offer luxury vacation homes equipped with IoT devices for smart home or boat experiences. Multiple members share ownership and access, enjoying connected amenities without the full cost of ownership.</p>

Business Model	Franchising
Description	Allowing others to operate under your brand and business model in exchange for fees or royalties.
Examples	<p>Anytime Fitness with Connected Equipment</p> <p>Anytime Fitness franchises use connected fitness equipment that integrates with the brand's app, providing consistent user experiences across all locations and collecting data to improve services.</p>

Business Model	Freemium
Description	Offering basic services free of charge while charging for premium features.
Examples	<p><u>IFTTT (If This Then That)</u></p> <p>IFTTT is a platform that connects various IoT devices and services.</p> <p>Users can create simple automation tasks (applets) for free. However, advanced features like unlimited applet creation and prioritized support are available through a paid subscription.</p>

Business Model	From push-to-pull
Description	Transitioning from pushing products to consumers to creating demand that pulls consumers to products.
Examples	<p>Customized IoT Solutions by Demand</p> <p>Siemens offers customized industrial IoT solutions based on specific client demands rather than standard offerings, pulling customers through tailored proposals that meet exact needs.</p>

Business Model	Hidden revenue
Description	Generating income through indirect means not immediately apparent to the customer.
Examples	<p>Smart TV Manufacturers Selling User Data</p> <p>Some smart TV brands offer devices at low prices but generate revenue by collecting and selling user viewing data to advertisers and content providers, a revenue stream hidden from the consumer.</p>

Business Model	Ingredient branding
Description	Promoting a component or technology within a product to leverage its brand value.
Examples	"Powered by Alexa" in Smart Devices Devices like the Sonos One speaker highlight the inclusion of Amazon's Alexa voice assistant, leveraging Alexa's brand to enhance product appeal and differentiate from competitors.

Business Model	Integrator
Description	Combining various products and services into a comprehensive solution for customers.
Examples	<p>ADT Home Security Systems</p> <p>ADT integrates various connected devices—cameras, sensors, smart locks—into a unified home security solution, providing installation, monitoring, and support services as a complete package.</p>

Business Model	Layer Player
Description	Specializing in one layer of the value chain across multiple industries.
Examples	<p>Twilio's IoT Communication APIs</p> <p>Twilio provides communication APIs that enable IoT devices to send and receive messages across various applications and industries, focusing on the communication layer.</p>

Business Model	Leverage customer data
Description	Using customer data to improve services or create new revenue streams.
Examples	<u>Nest Thermostats</u> Nest collects data on user habits to optimize home heating and cooling. Aggregated data can be used to improve energy efficiency programs or inform utility companies.

Business Model	License
Description	Allowing others to use intellectual property in exchange for a fee.
Examples	<p><u>ARM</u></p> <p>ARM does not manufacture chips but licenses its semiconductor architecture to companies like Apple, Qualcomm and Samsung. These companies use ARM's IP to design their own processors.</p> <p>This model enables ARM to dominate the mobile and IoT processor market without the cost of manufacturing, while companies get access to cutting-edge chip designs.</p>

Business Model	Lock-in
Description	Creating high switching costs to retain customers within a product ecosystem.
Examples	<u>Apple's HomeKit</u> Apple's HomeKit provides a framework for home automation. Devices compatible with HomeKit often only work within the Apple ecosystem, encouraging users to stay with Apple products.

Business Model	Long Tail
Description	Selling a wide variety of niche products in small quantities.
Examples	<p>App Stores for Niche IoT Applications</p> <p>The Apple App Store and Google Play Store offer thousands of niche IoT apps that cater to specific devices or functionalities, allowing developers to reach users interested in specialized connected solutions.</p>

Business Model	Make More of it
Description	Leveraging existing assets or capabilities to create new revenue streams.
Examples	<p>Tesla's Supercharger Network</p> <p>Tesla uses its network of charging stations not only to support its electric vehicles but also plans to open it to other EV brands for a fee, maximizing the utility of their existing infrastructure.</p>

Business Model	Mass Customization
Description	Combining mass production efficiency with individual customization.
Examples	<p>Manufacturing has evolved from traditional mass production to a more flexible, customer-centric approach known as mass customization. With increasing consumer demand for personalized products, manufacturers must balance customization with cost efficiency.</p> <p>This is where IoT plays a crucial role in enabling real-time adaptability, process automation and seamless supply chain integration.</p> <p>IoT sensors collect real-time production data, allowing manufacturers to adjust settings dynamically based on customer preferences. This enables businesses to:</p> <ul style="list-style-type: none"> • Monitor production lines and adjust machine parameters for custom orders • Predict demand patterns and adjust inventory levels accordingly • Ensure quality control by tracking defects and optimizing processes <p>For instance, smart clothing manufacturers use IoT sensors to adjust fabric cutting and stitching based on customer specifications, reducing material waste and improving efficiency.</p>

Business Model	No frills
Description	Offering basic products or services without extras, focusing on cost efficiency.
Examples	<p>Xiaomi's Affordable Smart Devices</p> <p>Xiaomi provides budget-friendly connected devices like smartphones and fitness bands with essential features, making IoT technology accessible to a broader market without unnecessary add-ons.</p>

Business Model	Open Business Models
Description	Collaborating with external partners and stakeholders to share risks and rewards.
Examples	<u>Linux Foundation's EdgeX Foundry</u> EdgeX Foundry is an open-source project building a common framework for IoT edge computing, encouraging collaboration among businesses, developers, and technologists to accelerate innovation.

Business Model	Open Source
Description	Providing source code for products freely, allowing community collaboration.
Examples	<p><u>Arduino Hardware</u></p> <p>Arduino offers open-source hardware and software platforms. Developers and hobbyists use Arduino boards to create custom IoT devices, fostering innovation and widespread adoption.</p> <p><u>Eclipse Mosquitto</u></p> <p>Eclipse Mosquitto is an open source (EPL/EDL licensed) message broker that implements the MQTT protocol versions 5.0, 3.1.1 and 3.1. Mosquitto is lightweight and is suitable for use on all devices from low power single board computers to full servers.</p>

Business Model	Orchestrator
Description	Coordinating a network of partners to deliver value to customers.
Examples	<p><u>Sigfox's IoT Network</u></p> <p>Sigfox provides a global IoT network by partnering with local operators. They orchestrate a cohesive network that allows connected devices to communicate efficiently worldwide.</p>

Business Model	Pay per Use
Description	Charging customers based on their actual usage of a service or product.
Examples	<p>Azure IoT Hub</p> <p>Microsoft's Azure IoT Hub allows businesses to connect, monitor, and manage billions of IoT assets. Companies are charged based on the number of messages sent per day, aligning costs with actual usage.</p>

Business Model	Pay what you want
Description	Allowing customers to decide the price they pay for a product or service.
Examples	Sensor-Based Donation Systems Museums or galleries using connected donation boxes that suggest contributions but allow visitors to pay what they want, with sensors tracking engagement levels for analytics.

Business Model	Peer-to-peer
Description	A decentralized network where users share resources directly.
Examples	<p>Helium Network</p> <p>Helium allows users to set up IoT hotspots, providing network coverage for IoT devices. Participants earn cryptocurrency for sharing their network.</p>

Business Model	Performance-based contracting
Description	Charging based on the performance or outcome of a service.
Examples	<p><u>Rolls-Royce's "Power by the Hour"</u></p> <p>Airlines pay Rolls-Royce based on engine uptime and performance, with IoT sensors monitoring engine health to ensure optimal operation.</p>

Business Model	Razor and blade
Description	Selling a base product at a low price and profiting from the ongoing sale of consumables.
Examples	<p><u>Amazon Kindle and eBooks</u></p> <p>Amazon sells Kindle devices at competitive prices. The ongoing revenue comes from selling eBooks, which are easily purchased and downloaded through the connected device.</p>  <ul style="list-style-type: none"> ● HP ink ● Playstation and Videogames

Business Model	Rent instead of buy
Description	Offering products for temporary use rather than purchase.
Examples	<u>Bird Electric Scooters</u> Bird provides IoT-connected electric scooters for short-term rental in urban areas, with usage tracked and billed via a mobile app.

Business Model	Revenue sharing
Description	Sharing profits with partners who contribute to the product's success.
Examples	<p>App Developers on IoT Platforms</p> <p>Developers create apps for platforms like Samsung SmartThings and share revenue generated from app sales or in-app purchases.</p>

Business Model	Reverse engineering
Description	Analyzing a competitor's product to develop a similar or improved offering.
Examples	<p>Generic Connected Home Devices</p> <p>Manufacturers reverse-engineer popular smart home devices to create compatible products at lower prices, offering similar connected functionalities to budget-conscious consumers.</p>

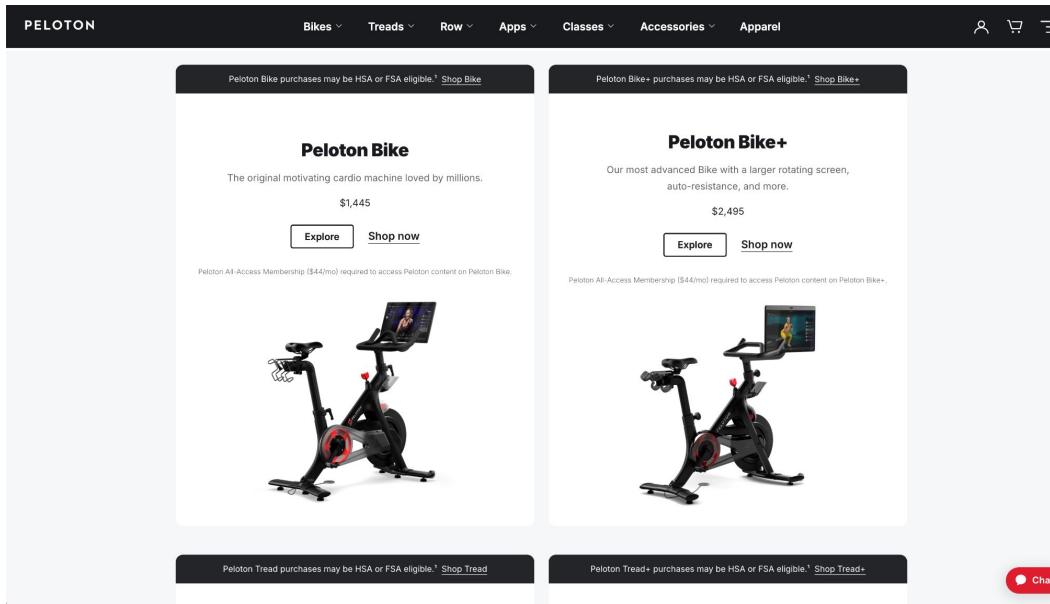
Business Model	Reverse Innovation
Description	Developing products initially for emerging markets and then adapting them for developed markets.
Examples	<p>GE's Low-Cost Connected Medical Devices</p> <p>GE developed affordable, connected medical equipment like portable ECG machines for rural healthcare in India, later introducing these innovations to cost-sensitive segments in developed countries.</p>

Business Model	Robin Hood
Description	Charging higher prices to one customer segment to subsidize lower prices for another.
Examples	<p>TOMS' Smart Eyewear</p> <p>For every pair of connected eyewear sold at full price in developed markets, TOMS donates resources to provide eye care in underprivileged regions, balancing profits with social impact.</p>

Business Model	Self-Service
Description	Enabling customers to perform services themselves, reducing operational costs.
Examples	Self-Service Kiosks with IoT Integration McDonald's uses IoT-enabled self-service kiosks allowing customers to place orders and make payments without cashier assistance, improving efficiency and customer experience.

Business Model	Shop-in-Shop
Description	Featuring a dedicated branded space within a larger retail environment.
Examples	Samsung Experience Stores in Best Buy Samsung sets up dedicated areas within Best Buy stores where customers can interact with their connected devices, providing a focused brand experience within a broader retail setting.

Business Model	Solution provider
Description	Offering comprehensive solutions, integrating multiple products and services.
Examples	<u>GE's Predix Platform</u> GE provides an industrial IoT platform offering end-to-end solutions for asset performance management, integrating hardware, software, and analytics.

Business Model	Subscription
Description	Customers pay a recurring fee to access a product or service.
Examples	<p><u>Peloton Interactive Fitness Equipment</u></p> <p>Peloton sells connected fitness equipment like bikes and treadmills. Users subscribe to monthly plans to access live and on-demand workout classes streamed directly to their devices.</p> 

Business Model	Supermarket
Description	Offering a wide range of products under one roof, often at competitive prices.
Examples	<p>B8ta Retail Stores</p> <p>B8ta stores showcase a wide variety of innovative connected products from different brands, allowing customers to try before they buy, acting as a physical marketplace for IoT gadgets.</p>

Business Model	Target the poor
Description	Creating affordable products specifically designed for low-income consumers.
Examples	<u>M-KOPA Solar Home Systems</u> M-KOPA provides pay-as-you-go solar energy solutions with IoT connectivity for off-grid households in Africa, offering affordable access to electricity and connected services.

Business Model	Trash-to-cash
Description	Turning waste or by-products into valuable resources.
Examples	<p>TerraCycle's Connected Recycling Programs</p> <p>TerraCycle uses IoT technology to optimize waste collection and recycling processes, turning trash into reusable materials, and offering rewards to users who participate through connected devices.</p>

Business Model	Two-sided market
Description	Connecting two distinct user groups that benefit from each other.
Examples	<u>Amazon's Alexa Skills Marketplace</u> Developers create skills for Alexa, while users access these skills on their devices. Amazon facilitates this interaction, benefiting both parties.

Business Model	Ultimate Luxury
Description	Providing high-end products with exclusive features and premium pricing.
Examples	<p>Lamborghini's Connected Supercars</p> <p>Lamborghini offers supercars equipped with advanced IoT features like real-time telemetry and personalized driving modes, catering to customers seeking the pinnacle of luxury and performance in connected vehicles.</p>

Business Model	User designed
Description	Allowing customers to participate in the design of products.
Examples	<u>Thingiverse by MakerBot</u> An open platform where users upload and share 3D printable designs for IoT devices, enabling community-driven product creation. <u>Cricut Marketplace</u>

Business Model	White Label
Description	Selling generic products that other companies rebrand as their own.
Examples	<u>Tuya Smart IoT Platform</u> Tuya provides a white-label IoT platform that manufacturers can customize and brand as their own, accelerating product development.

Business Model	Guaranteed availability
Description	Ensuring a product or service is available when needed.
Examples	<u>Azure IoT Hub</u> Microsoft guarantees uptime and performance for its IoT services through Service Level Agreements, providing reliability for critical applications.

Add-on	Hidden revenue	Razor and blade
Affiliation	Ingredient branding	Rent instead of buy
Aikido	Integrator	Revenue sharing
Auction	Layer player	Reverse engineering
Barter	Leverage customer data	Reverse Innovation
Cash Machine	License	Robin Hood
Cross Selling	Lock-in	Self-Service
Crowd-funding	Long tail	Shop-in-Shop
Crowd-sourcing	Make More of it	Solution provider
Customer Loyalty	Mass Customization	Subscription
Digitization	No frills	Supermarket
Direct Selling	Open business model	Target the poor
E-commerce	Open Source	Trash-to-cash
Experience Selling	Orchestrator	Two-sided market
Flat rate	Pay per Use	Ultimate Luxury
Fractional Ownership	Pay what you want	User designed
Franchising	Peer-to-peer	White Label
Freemium	Performance-based contracting	Guaranteed availability
From push-to-pull		