

## UNIT - IV

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups.

Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

The business model canvas

The business model canvas framework suggests four main perspectives:

1. infrastructure (key partners, key activities, key `resources),
2. Offering (value proposition)
3. customer (customer relationship, channel, customer segments), and
4. Financial perspectives (cost structure, revenue structure).

Each major category is comprised of one or a few criterion.

Infrastructure

This section is all about the things you need—[people, processes, technology, and partners](#)—to run your business.

Key activities: What does your business do? Are you managing large software teams? Do you have to manage a large supply chain? These are activities essential to the business. If your business is a salon, for examples, your key activities might be hiring and training staff, cutting and styling hair, opening and closing the shop, sending emails and offers, and making thank you cards to improve customer relations.

Key resources: These are the things you need to perform your key activities, in order to [create value](#). The key resources of a salon are staff, a physical location, marketing, and customers. Which resources do you have that are unique to you and give you an advantage? It could be that you get discounted hair products from the manufacturer because you worked there for 15 years or

Partner network: These are people in your network who can help you. People reading your business model canvas like to see that you are not a lone wolf, starting from scratch. They want to see you have support. They want to see that they are not the only ones who are

signing up to help your business succeed. These can be team members, suppliers, marketing avenues, etc.

## Offering

This section explores the value you offer.

Value proposition.: Your value proposition is the most important component of any business. Why are you valuable? If the business provides no value, then, why? Why should anyone buy into it? Why should anyone support it? Why does anyone need it? This value needs to be directed at who your business serves in the marketplace. The value needs to be directed at who your business targets. Google helps people find things they wish to know.

## Customers

This section is all about your customers: whether, where, and how you talk to them and they buy from you.

Customer segments: These are the people to purchase your product. It is helpful to think of your first customer. In the end, you may want everyone to be a customer, but, right now, who will be the first person to buy your product? Customer segmentation can be categorized by demographic, geography, social class, financial class, personalities, etc.

Channels: How do you meet your customers? Do you go to them? Do they come to you?

Channels could be Twitch.tv for a media platform. It could be a writing contest for a Hack-A-Thon. It could be the business location for a coffee shop. It could be a website for a microservice. It could be engineers' Twitter accounts for any software company. **The channel is a pathway of communication that links a community to the business.**

Customer relationships: What kind of relationship do you want to have with your customer?

What is the relationship's nature? Transactional, personal, automated, self-service, community oriented. A vending machine is self-service. Major cloud providers are mostly

self-service. They lack in support so much that other companies can be built entirely around providing customer service for their platform. Other cloud providers are popping up, too, whose business' value proposition is that they have phone-call customer service—a unique value for certain categories of customers.

## Finances

The finances section really wants to know your income statement. What are your costs and how do you bring in money?

Cost structure: What are your company's costs? Income statements do a good job of putting expenses into [operating expenses and capital expenses](#), and that can serve as a good model for this part of the canvas. Operating expenses are the day-to-day costs of doing business. At the salon, it would be largely labor costs for hiring stylists to cut hair. Capital expenditures would be costs associated with stocking shelves with hair products, rent costs, and electricity costs.

Revenue streams: Finally, how does your company make money? The salon makes money by cutting and styling hair. They maintain a register to sell hair products. Maybe they create distinctions in their stylist offerings and do normal cuts, styled cuts, perms, colorings, and events like weddings or model shoots.

## Models

A good IoT business model is one that supports a viable business for customers and delivers value easily and efficiently. The IoT business model you choose or create is only restricted by your creativity and willingness to try.

Here are the top IoT business models

### 1. Platform business model

The [platform-based business model](#) combines manufacturers and consumers in the marketplace to benefit both. The key to it is interoperability and interconnection of the devices and the business to generate revenue from related transactions.

Amazon and its Alexa voice recognition platform is a good example of this, as Amazon generates data through Alexa and then uses it to sell related products to consumers.

## **2. Subscription model**

Businesses can use the always-on connectivity of IoT devices to develop a [recurring revenue business](#) or subscription model. Like the as-a-service business model for technology, an IoT subscription model enables you to deliver continuous value to customers for a regular fee.

Your device gathers more data about customers over time, giving you the chance to provide valuable features and products tailored to their unique needs.

## **3. Pay-per-usage model**

Active sensors on your IoT devices mean you can regularly monitor your customer's environment to see how much they use your product or service. This gives you an opportunity to use a [pay-per-usage business model](#) where you charge them for the amount of time they actively interact with your product.

Many auto insurance companies are jumping into this model by offering a mileage-based insurance plan to customers. People don't pay for the IoT device installed on their car that tracks their driving usage and habits; they pay for the lower rates based on the data they generate on the device.

Rolls-Royce has been doing this for years with their [TotalCare program](#), where airlines are charged on a fixed dollar per flying hour basis for the use of the engines on their planes.

## **4. Asset-sharing model**

Many industries have big expenditures when it comes to vital equipment. They want to be sure they're going to use the equipment enough to merit the expense. An [asset-sharing business model](#) for IoT could help with this by helping businesses sell their extra capacity back to the market. That way, each business pays a reduced price for the equipment and can still use it.

Businesses could use this model on their own assets or as their main business by renting out large assets for sharing.

## **5. Asset-tracking model**

Connected devices in the supply chain help businesses identify, monitor and track assets in real time. It helps them protect in-field assets from loss or theft while monitoring for maintenance purposes. With the data generated by connected devices on these assets, businesses can check on their status regularly and know when to repair, fix or replace assets before they fail. This business model can also track the supply chain to identify inefficiencies, optimize workflows and increase visibility into usage.

Sierra Wireless helps global companies track their [cold-chain cargo integrity](#) with high-value IoT asset tracking platforms. Temperature-sensitive cargo such as food, produce and pharmaceuticals require precise temperature controls throughout the cold chain to maintain the integrity of the loads. As pressures mount for the refrigerated cargo industry as a whole, carriers can use these types of IoT sensors and online [tracking platforms](#) to ensure complete visibility of cargo, maintain adequate temperatures and take swift action on any identified issues.

## **6. Outcome-based model**

The idea for this model is for customers to pay for the outcome of the IoT product, not the product itself. Many of the models discussed here are outcome-based, as they focus more on what customers gain from the device, rather than the device itself.

Self-monitoring products that can automatically reorder replacement parts or create a service request are good examples of this. Think of the HP printers that reorder ink cartridges automatically when you're nearly out of ink or the [industrial company](#) whose products automatically book a service call when they're not working optimally.

An innovative example of this is Propeller Health's digital health tool, Propeller. It enables those with asthma or chronic obstructive pulmonary disease manage their conditions in partnership with their clinicians and an IoT sensor attached to their inhalers. The sensors connect to the

Propeller app on patients' smartphones and deliver insights on medication use, symptoms, triggers and environmental factors. Patients can share that data with their clinicians to inform their treatment plans and identify better outcomes.

## **7. Compliance model**

[Compliance tracking is vital](#) to many industries and costs a lot of time, effort and money.

Depending on the industry, there might be significant checks that must be done for safety, environmental or legal reasons. Deploying IoT devices into the field can help reduce the cost of compliance by making your business more responsive to changes before they become a problem.

IBM's Vegetation Management platform combines weather, satellite and IoT data to help utilities make better decisions. Vegetation-related outages are among the top reasons for outages globally and affect system reliability and customer satisfaction. Compliance is critical in such a highly regulated industry. IBM's platform helps utilities monitor sites in real-time and offers relevant insights to help with budget allocation, work planning, hazard reporting and regulatory reporting.

## **8. Data-driven model**

A popular IoT business model is the data-driven model powered by the data generated by your devices. You build a product that provides value to customers and collects data that you can use for other products or sell to a third party. This model works well [if you have many devices out in the field](#) collecting data and if you've notified customers that you're using their data for this.

There are many ways to use this business model outside of the classic online shopping model -- where consumers get product suggestions based on their browsing or purchase history. For example, in office buildings, energy efficiency devices can monitor energy consumption and be used by landlords to manage HVAC and energy usage throughout the day. This data can also be sold to utility companies for forecasting purposes as they manage the local energy grid.

## **9. Service-adjacent model**

In this model, your business offers a service that enhances the use of the IoT device but doesn't necessarily sell the device itself. The device is the enabler of your service, not the main point of your business.

For example, you use an IoT device to monitor a network or system, predict maintenance timelines and sell a maintenance contract to customers. You don't create or develop the device. You might not even install the device but know of it and how it's used in the industry. You could partner with an IoT manufacturer to create a service industry that supports it.

There are many [ways to incorporate IoT](#) into your business model. Many businesses are combining them in creative ways to maximize their opportunities and diversify their revenue streams. You can be an IoT vendor, provider or partner, generating new revenues as you deliver more value to your customers.

### Funding an Internet of Things startup

There are three ways you can obtain funding for your IoT startup — whether you're just starting or are already busy completing orders.

Want to build an IoT company that lasts? Here are three easy ways to generate funds:

#### 1. ANGEL INVESTOR SETUPS, PLATFORMS AND GROUPS

One popular angel investor setup is the [Angel Capital Association \(ACA\)](#) which offers a directory of angel groups and accredited platforms that can help you learn about different angel investors and what areas they invest in. [Angel.co](#) is another platform where your IoT startup can discover potential investors.

If you're looking for a global platform to find the right investor for your IoT startup, you might be interested in [DreamFunded](#). All you have to do is create a profile that can be seen by thousands of investors. You may also use their directory to find those who specifically fund IoT ventures.

#### 2. FUNDING ACCELERATORS AND INCUBATORS DEDICATED TO IOT

You can also look for abundant accelerators and incubators that are dedicated specifically to IoT. Along with providing funding, they can also offer you space to work, partnership features, mentoring and networks that can help you launch your startup.

For example, [IoT Perspectives](#) highlights various accelerators and incubators by category, comprising their favored contribution stage in your venture.

Several big names like Microsoft, Siemens and Cisco are also readily investing in the IoT sector. And, SAP, which is the exclusive financier in [Sapphire Ventures](#), also funds IoT startups and other tech enterprises.

### 3. CROWDFUNDING

Crowdfunding is no longer restricted to raising money for social causes and charities. In fact, it's a great way to generate funds for your IoT startup.

One recognized crowdfunding website is [Indiegogo](#) that has partnered with Arrow Electronics and IBM to make it easier for tech startups to secure funding. And, several IoT startups are leveraging this opportunity to generate funds for themselves.

[IoT.do](#) is another crowdfunding initiative by the [Prism Group](#) that helps you raise funds for your IoT project by requesting a large number of individuals, each for a small amount of money.

Based in New York, [Kickstarter](#) has emerged as a global [crowdfunding](#) platform that focuses on resourcefulness and merchandising. Since its launch in April 2009, it has successfully funded more than 160,000 projects and yours could be next!

Whether you're planning to launch an IoT project or are already rolling out one, we can help you start and manage a crowdfunding campaign.

### Lean Startups

**Lean startup** is a [methodology](#) for developing businesses and products that aims to shorten product [development cycles](#) and rapidly discover if a proposed [business model](#) is viable; this is achieved by adopting a combination of business-[hypothesis](#)-driven experimentation, iterative



product releases, and [validated learning](#). Lean startup emphasizes customer feedback over intuition and flexibility over planning. This methodology enables recovery from failures more often than traditional ways of product development

## Principles

---

### Minimum viable product

A [minimum viable product](#) (MVP) is the "version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort"

The goal of an MVP is to test fundamental business hypotheses (or leap-of-faith assumptions) and to help entrepreneurs begin the learning process as quickly as possible

### Continuous deployment

Continuous deployment, similar to [continuous delivery](#), is a process "whereby all code that is written for an application is immediately deployed into production," which results in a reduction of [cycle times](#).

### Split testing

A split or [A/B test](#) is an experiment in which "different versions of a product are offered to customers at the same time. The goal of a split test is to observe differences in behavior between the two groups and to measure the impact of each version on an actionable metric.

A/B testing is sometimes incorrectly performed in serial fashion, where a group of users one week may see one version of the product while the next week users see another. This undermines the statistical validity of the results, since external events may influence user behavior in one time period but not the other. For example, a split test of two ice cream flavors performed in serial during the summer and winter would see a marked decrease in demand during the winter where that decrease is mostly related to the weather and not to the flavor offer.

Another way to incorrectly A/B test is to assign users to one or another A/B version of the product using any non-random method.

### Actionable metrics

Actionable metrics can lead to informed business decisions and subsequent action. These are in contrast to vanity metrics—measurements that give "the rosier picture possible" but do not accurately reflect the key drivers of a business.

## **Pivot**

A pivot is a "structured course correction designed to test a new fundamental hypothesis about the product, strategy, and engine of growth.

## **Innovation accounting**

This topic focuses on how entrepreneurs can maintain accountability and maximize outcomes by measuring progress, planning milestones, and prioritizing.

## **Build-Measure-Learn**

The Build–Measure–Learn loop emphasizes speed as a critical ingredient to customer development. A team or company's effectiveness is determined by its ability to ideate, quickly build a [minimum viable product](#) of that idea, measure its effectiveness in the market, and learn from that experiment. In other words, it is a [learning cycle](#) of turning ideas into products, measuring customers' reactions and behaviors against built products, and then deciding whether to persevere or pivot the idea; this process repeats as many times as necessary. The process can also be viewed as a test of hypotheses. The phases of the loop are: Ideas → **Build** → Product → **Measure** → Data → **Learn**

## Designing kits

What is designing kits in IoT?

The IOT design kit is a set of design and strategy workshop tools. Each element of the kit is created in such a way that it can be used standalone or as part of an idea generation and validation process.

The kit consists of several Internet of Things idea generation and definition tools created to support multidisciplinary teams in the early phases of an IoT product design process.

## PCB APPLICATIONS DRIVEN BY IOT



PCBs are at the center of enabling electronic devices to offer IoT capabilities found in smart home applications or mobile screens in car dashboards.

PCBs are at the center of enabling electronic devices to offer IoT capabilities found in smart home applications or mobile screens in car dashboards, but IoT is also influencing **PCB design and applications** to meet rising demand for new methods of using the internet, including:

- Sensors and cameras in automobiles and home utilities to offer higher levels of efficiency, convenience and security.
- Fitness trackers whose data can be analyzed remotely.
- Hue-changing lightbulbs that create custom moods for different rooms, manageable from tablets or even smaller smart devices.
- Grid layouts in shopping centers that monitor consumer routes to provide customized sale opportunities for both retailers and customers.

## THE IOT OPPORTUNITY FOR FLEX AND HDI PCBS



For the functionality and sustainability of new form aspects, printed electronics lead the way in making sophisticated manufacturing possible.

## Flex Printed Circuit Boards and IoT Advantages

Introducing [flex PCBs](#) dramatically reduces design limitations you might find with more rigid, traditional PCBs. Not only does a flexible board structure make way for revolutionizing the forms and shapes our electronics can take but also costs and errors can be reduced

Some of the best attributes of flex PCBs that make them suitable for IoT-focused designs include:

- Smaller size
- Lighter weight: With the lower space occupancy also comes weight savings of up to 95 percent.
- Greater resistance: Flex PCB materials offer an improved level of durability, increasing their resistance. Devices like fitness trackers, flex PCBs can resist errors caused by regular movement, body heat or humidity.
- Clearer wiring routes: Flex PCBs simplify wiring methods with their elimination of mechanical connectors.

#### PCB DESIGN REQUIREMENTS FOR THE INTERNET OF THINGS

- Size requirements. Small devices are only getting smaller. PCB designers no longer have extra board layout space in their strategic placement of tracks and components. Now, proper functionality and flexibility in tiny areas are only made possible through HDI and rigid-flex boards. And with these smaller forms, it is more crucial than ever to make sure all IoT product designers are on the same page from the very beginning of the design stage.
- Product fitting. In addition to the size of your PCB, you'll want to do enough virtual prototyping to make sure you can easily incorporate the shape of your design into the IoT form it's intended for. Circuits in IoT often will need to fit around non-traditional materials for best functionality, and you may find yourself opting for a mesh or plastic component in your designs that you did not expect.
- Adapting for the human body. Another set of qualities that will require thorough simulation tests to optimize are the mechanics that may be affected by human body temperature, moisture and constant movement. Naturally, this is only if the intended final IoT product is wearable or comes in contact with human skin. Pay close attention to thermal effects and aim for a design that will enable sufficient cooling when necessary.
- Power consumption. IoT requires a focus on extended battery life and power integrity wherever possible, as these devices are in constant communication with their networks. Energy usage

needs to be kept to a strict budget within the individual circuit blocks on your PCB to help the product as a whole remain in a suitable range of power consumption. The key is to plan power consumption precisely and follow up your plans with thorough testing of the various task cycles of your PCB, including sending and standby power states.

- Reliability standards. Industry norms for the trustworthiness of electronic devices are consistently advancing.

Consumers want to make sure their devices are operational and will stay accurate over long periods of time. With the pressure designers feel to create products that withstand a myriad of potential conditions, many turn to simulation software to test out their designs.

- Wireless connectivity. The internet is in the name of IoT, and being able to access it is a core requirement for any IoT PCB. Collecting and sending data about surroundings will require installing the right wireless modules and RF circuit components. To choose the right parts, you'll want to remember to keep power consumption, network range and speeds, and any security needs in mind.