

Extending and Redefining *the Useful Life* **of Smartphones**

MA Design Management Thesis Proposal Fall 2015

Adam Roush

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Abstract

Consumer culture and new technologies drive people to upgrade smartphones long before obsolescence is an issue. This creates a surplus of pocket-sized computers with vivid displays, a host of sensors and no clear-cut purpose in the world. The objective of this project is to radically influence how people understand their smartphones by reconstructing the context through which they are perceived.

Introduction



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Smartphone Defined

Smartphones are some of the most sophisticated, widespread and technologically advanced devices on the planet. Smartphones today have more computing power than NASA used to go to the moon in the 1960s. Every day they are becoming more and more essential to the lives of the people who use them.

Tremendous industry resources are focused on making smartphones better smartphones. This means that more appealing smartphones are constantly hitting the market, enticing people to upgrade, with a value proposition of better capabilities and new features.



“ Smartphones today have more computing power than NASA used to go to the moon in the 1960s. ”

Market Statistics

51%

of smartphone owners would upgrade to a new model as soon as their provider allows it

1.2 billion

smartphones were sold in 2014

61%

of consumers keep their old phones

1 in 4 people

said they don't know what to do with the device after they've replaced it

41%

of consumers have 1 - 2 old smartphones

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Smartphones in Context

So what is a smartphone? What does it mean to the people who use them? A smartphone is how we connect with the people we love, how we capture precious life events, and how we access the wealth of information in the world. It's the first thing we reach for when we wake up and the last thing we set down before bed. It is a single device that is arguably more essential than any other in our lives.

We understand smartphones in a very narrow and specific context. It is something that must function in a myriad of different capacities. We must be able to hold it in our hand, it must have a beautiful display and poses a multitude of sensors and features that are all powered by a reliable battery which provides hours if not days of continuous use. With this long list of requirements, comes an even longer list of trade-offs and compromises.

The whole industry is making incremental improvements that better satisfy the specific use case of a smartphone. These improvements entice users to upgrade long before obsolescence is an issue - and nobody needs more than one smartphone at the same time.



There is a moment during the upgrade experience when a person's smartphone ceases to be their smartphone. The cellular coverage is transferred to another product and what was moments ago a digital companion in this modern world, is all of a sudden transformed into an outdated brick with questionable utility and value.

Big cell carriers capitalize on this device identity transition by offering miniscule amounts money to buy back your old smartphone. I remember after two years with my HTC EVO 4G, I was offered \$13 to trade it in. I was astonished at the undervaluation of this device.

In the world of consumer electronics, smartphones are very expensive to build and command a high retail price point. Because of the business models used by most major cellular network providers, the high cost of these products is somewhat shielded from the end user. These cellular carriers will often subsidize the device cost in exchange for a contractual commitment for cellular coverage. A smartphone upgrade might only cost the customer a few hundred dollars and sometimes nothing at all. This can leave the end user with a skewed perception of the cost and value of their device.

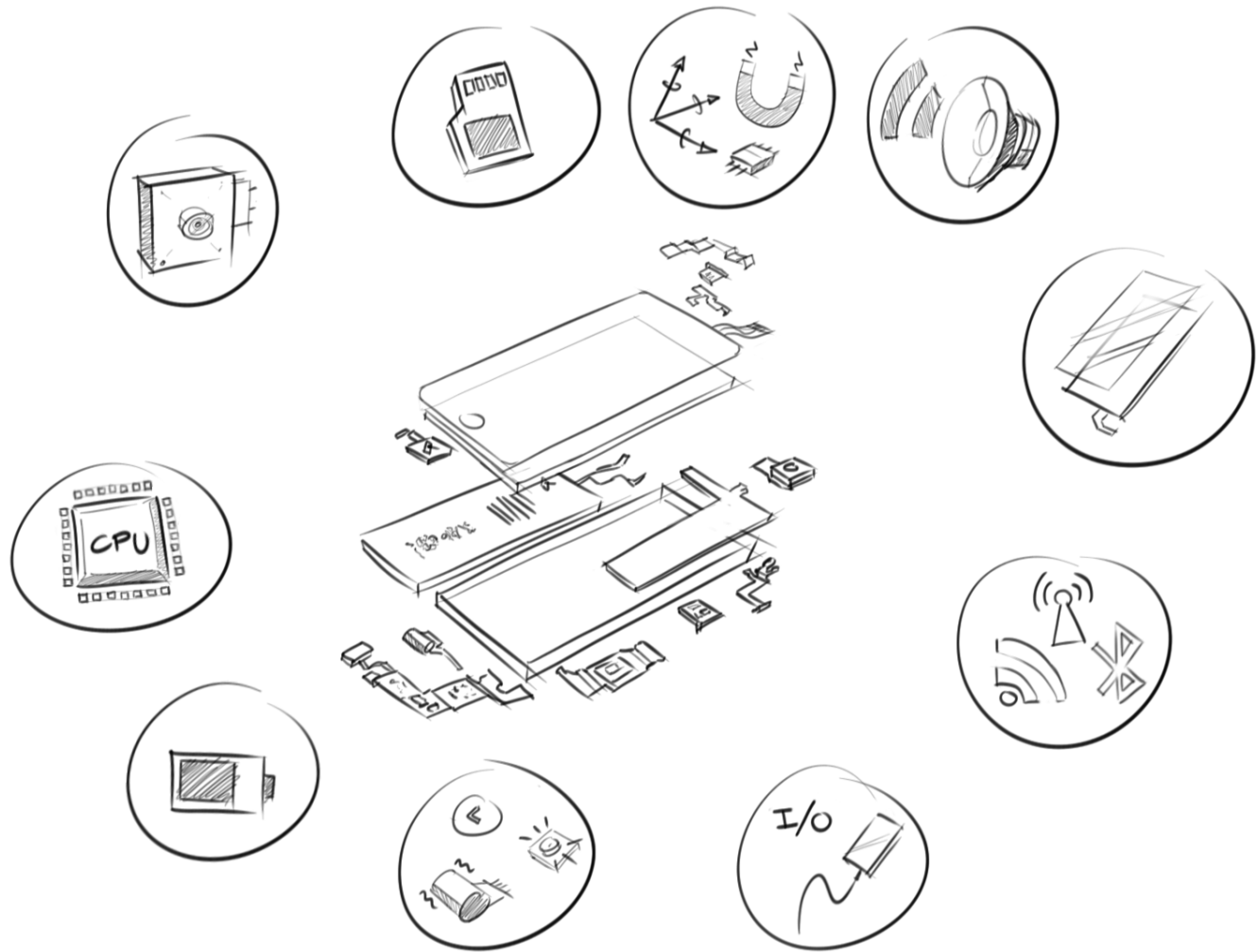
Outside of a dollar amount, what is the true value and potential of these "outdated" devices?

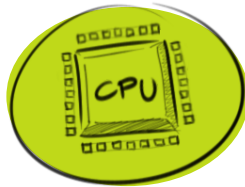
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Deconstructed Context

Let's take a look at the anatomy of a smartphone. As a whole, this is a versatile and portable device that we all know and value, but let's take a moment to consider the different components and their individual capabilities.

- Sensors
- Speaker/microphone
- Display and touch panel
- Antennas
- Input/output connections
- LEDs, vibration motors and physical buttons
- Battery
- CPU/computing power
- Camera(s)
- Memory





What if we were to isolate and combine some of these components outside of the narrow context of a smartphone? How could these components be repurposed and redefined? We understand smartphones so well it is difficult to immediately understand the potential application in this area.

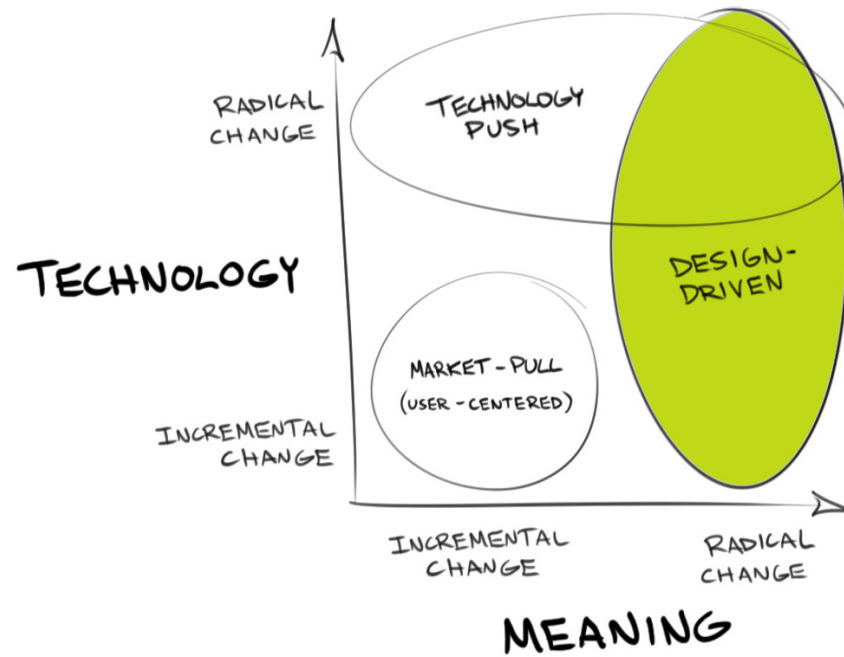
How can new meanings be derived from the existing technologies within a smartphone? What would a smartphone look like if we didn't need to carry it in our pocket? How could it function if it didn't need a physical display? These questions only begin to scratch the surface of possibilities this project aims to address.

This project aims to facilitate a broader understanding of the potential role of this technology in our everyday lives.

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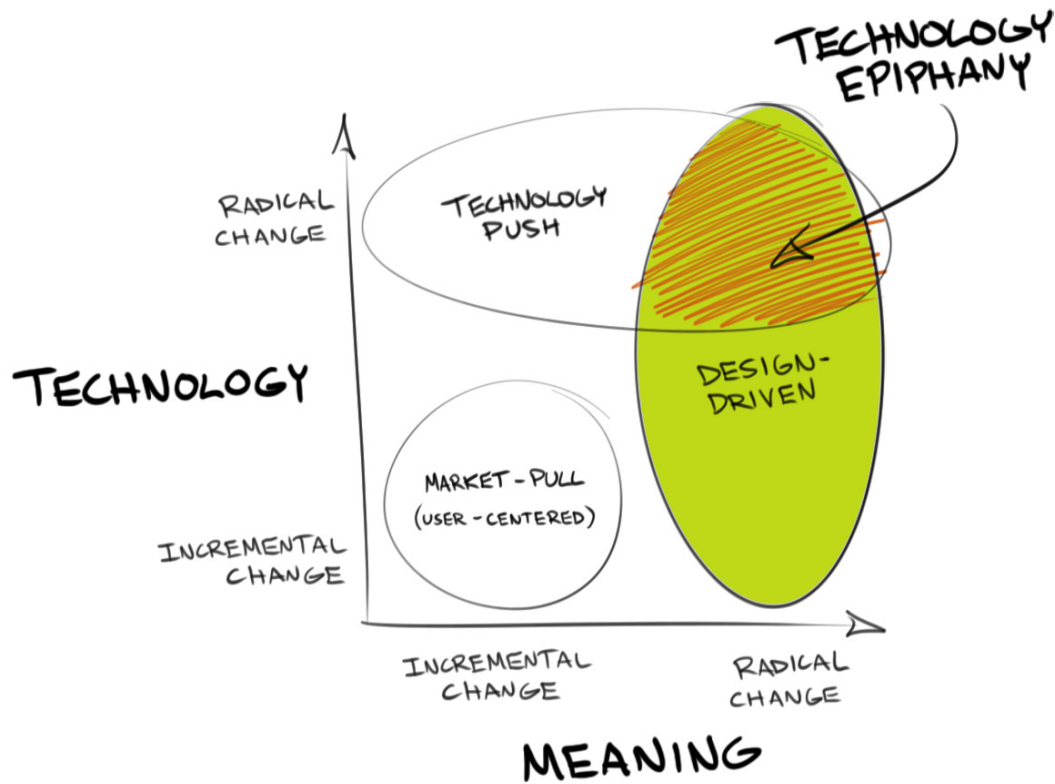
Radical Innovation of Meaning

One of the most influential books I read in the Design Management program was *Design-Driven Innovation* by Roberto Verganti. I find Verganti's approach to innovation to be particularly applicable for this subject:



“ Innovation has focused on two strategies: quantum leaps in product performance enabled by breakthrough technologies, and improved product solutions enabled by better analysis of users' needs. The former is the domain of radical innovation pushed by technology, and the latter of incremental innovation pulled by the market. ”

-Verganti, *Design-Driven Innovation*



This project is a perfect example of technological breakthroughs being merged with radical innovation of meanings. While the development of smartphone technology is being pulled along by the market demand, new meanings can be invented around the marginally outdated technology from one to two years in the past. The challenge is in enabling the user's understanding of potential new meaning and in actually facilitating the desired transformation of the technology.

There is an emerging trend around what to do with your old smartphone. Evidence of this can be seen in many recent articles around how to repurpose them. While this concept addresses marginally outdated technology, it is important to recognize that new devices are considered old in a matter of one to three years. That means this outdated technology is improving just as rapidly as the latest technology.

“ A particularly effective type of innovation strategy is when technological breakthroughs merge with radical innovation of meanings. ”

-Verganti, Design-Driven Innovation

Literature

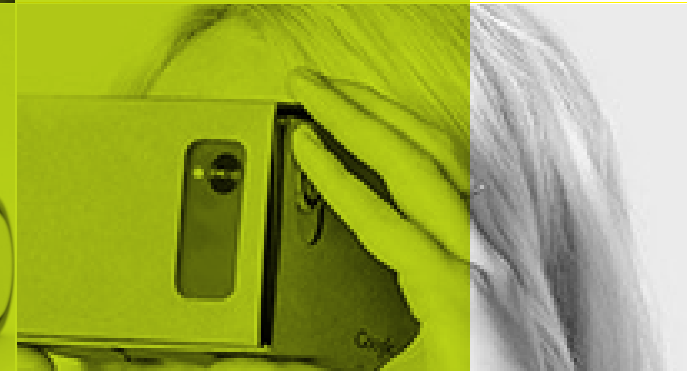


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Previous Work

As it happens, there's a plethora of creative uses for old smartphones, that can make your life — and the lives of others — far easier. Build an alarm clock. Or a robot. Help cure cancer. Secure your home. Save the rainforest. And much, much more.

The concept of repurposing a smartphone for other uses is not something unique to this project. This is an emerging global trend, therefore, there are plenty of products and apps that enable smartphones to transform into other devices. Just this year, many articles have been released around this topic. Let's look at some of the ideas and products already in the public domain.





Hand-Down Smartphone

The most obvious use for an old smartphone is to give or sell it to someone who needs the device to use as a smartphone and is willing to accept an older model.

Media Streamer or Game Console

This is another obvious use that begins to redefine how this technology fits into the lives of its users. However, this idea is simply removing the capabilities provided by the subscription to a cellular network and continuing to use the remaining features, such as a dedicated media player or game console for kids.

Wi-Fi Extender

For people with weak Wi-Fi in their homes, they can boost the signal throughout their house by installing an app that will pick up the signal and repeat it. An unused smartphone can be used as a dedicated device for this purpose.



Networked Security Camera

A networked security camera that you can remotely view and receive alerts from is a very expensive device. Instead, you can take advantage of your device's camera by turning it into a Wi-Fi enabled security camera to protect your home for a fraction of the cost. Apps exist that are motion-sensitive and will email the owner with photos. This system also leverages machine learning to detect when an object is present in the images that are being captured. This allows intuitive monitoring without bothering the user with false alarms.



Some other concepts are a little more out-of-the-box.

Rainforest Connection

Transforms recycled cell-phones into autonomous, solar-powered listening devices that can monitor and pinpoint chainsaw activity at great distance. This changes the game by providing the world's first real-time logging detection system, pinpointing deforestation activity as it occurs, and providing the data openly, freely, and immediately to anyone around the world. For the first time on a scalable level, responsible agents can arrive on the scene in time to interrupt the perpetrators and stop the damage, and the world can listen in as it occurs.

Google Cardboard

Cardboard aims at developing accessible virtual reality (VR) tools to allow everyone to enjoy VR in a simple, fun, and natural way. The Cardboard SDKs for Android and Unity enable you to quickly start creating VR apps or adapt your existing application for VR.



Computing Power for Research

Using a new app created by researchers at UC Berkeley, users will be able to donate a phone's idle computing power to crunch numbers for projects that could lead to breakthroughs ranging from novel medical therapies to the discovery of new stars.

Clearly, there are a lot of brilliant people working on great ideas in this category. However, the ideas can be quite complicated and intimidating to someone who is not technologically savvy.

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Research Questions

How can all of the incredible and unexpected potential uses for an old smartphone be made more accessible and approachable to people?

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Research Questions

**How can we foster the creative thinking
responsible for these transformations?**

Trends & Industry Factors



If This Then That

The If This Then That (IFTTT) is a web-based service that allows users to create chains of simple conditional statements, called “recipes.” These recipes are triggered based on changes to the user’s other services and products.

For example, if you want your house to be lit up when you come home - you can select a recipe that says **if** it’s 6:00pm, **then** turn on the lights.

Or you can set it up so that **if** your phone knows you are leaving work, **then** it will automatically send a text to your wife letting her know.



Connect Your Home



Keep in Touch



News Alerts





Stay Healthy





Shop Smarter



Be More Productive

if  **then** 

Unmute my phone when I get home

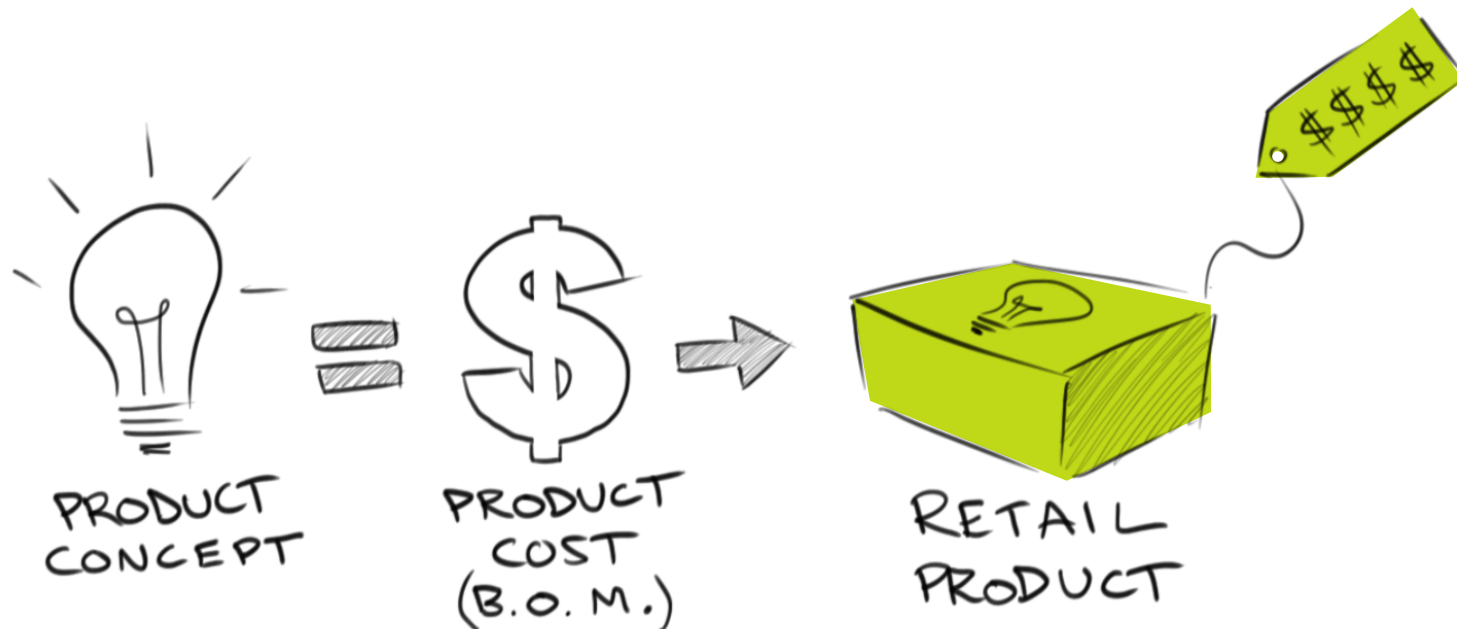
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Business Viability Model as a Limitation

I personally, have worked in the consumer electronics industry for more than five years. My particular role is to identify new and exciting product concepts to enrich the lives of our users. In my time in this industry and role, I have become very familiar with a paradigm: Just because a product concept makes perfect sense from the perspective of a user, it is not necessarily justified for production from a business perspective. The cost of materials required to build a specific product is referred to as a BOM (bill of materials).

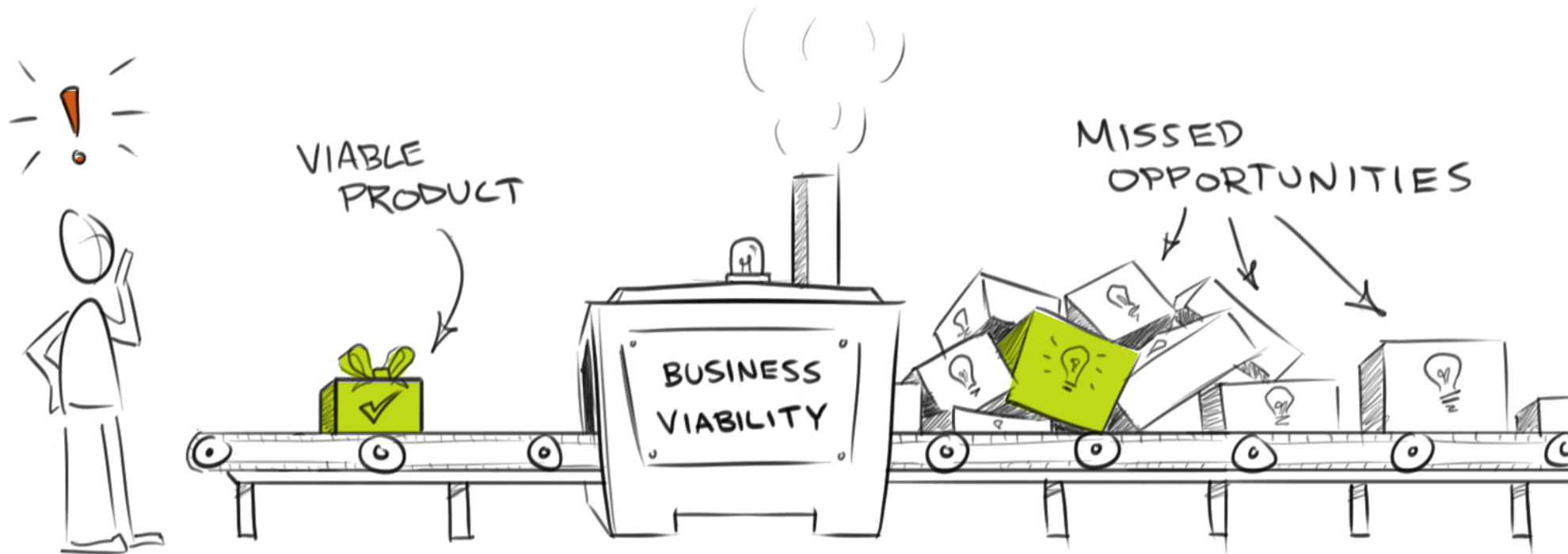
This is one major factor when it comes to determining profit margins and the viability of a product concept. The individual costs of components are usually reflected by three to four times in the retail product price. So, if the BOM for a product is \$25.00, then a reasonable retail price for that product would be around \$100.00. Of course there are many other factors that go into pricing, but taking the BOM times four is a good and quick sanity check for a realistic product concept.

Because of this industry element, I have become painfully aware of the impact every single component, finish and so on has on a final product. If a display in a product costs \$10.00 it will likely impact the retail price of the product by at least \$40.00. In a competitive market such as consumer electronics, this reality plays a big role in what concepts are taken through to mass-production.



By leveraging the components that a user may already have in an unused smartphone, there is an opportunity for disruption. For a product concept, say in the category of the IoT, every last sensor, display, antenna and so on, must be accounted for in the BOM and is ultimately reflected in the retail price. This inevitably rules out innumerable product concepts that are both simple and enriching to the lives of its intended users due to poor business viability. By reusing the expensive and sophisticated elements of an already owned, or inexpensive to obtain, device radically alters the business viability equation. Of course, this is easier said than done. The product concept, value proposition and accessibility of the product(s) must be crystal clear and compelling.

This is where design thinking can become a very valuable tool for disruption.



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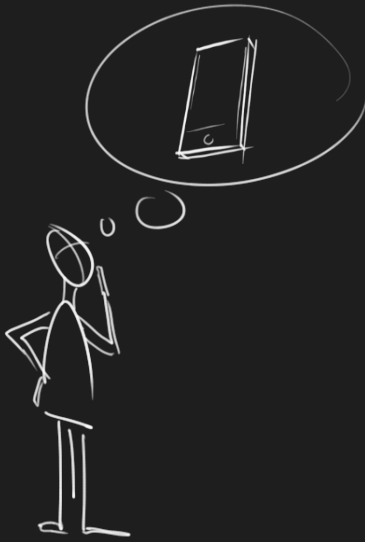
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MA Design Management Thesis Fall 2015

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Extending and Redefining *the Useful Life* of Smartphones



MA Design Management Thesis Fall 2015
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Smartphones are some of the most impressive and well understood devices on the planet. They are a big driving factor in technology, society and even the economy. These devices are incredibly versatile and yet they are intended for a very specific role in our lives.

Since the inception of the smartphone tremendous industry resources have been devoted to developing and marketing the technology in these devices, all with the end goal of convincing you that your current device isn't good enough and that this new version, no matter how incremental the improvements, will dramatically change your life.

On average, over half of all smartphone users upgrade to a new model as soon as their provider allows it.

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Abstract

Consumer culture and new technologies drive people to upgrade smartphones long before obsolescence is an issue. This creates a surplus of pocket-sized computers with vivid displays, a host of sensors and no clear-cut purpose in the world. The objective of this project is to radically influence how people understand their smartphones by reconstructing the context through which they are perceived.

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What is a Smartphone?



So what is a smart phone?...

A smartphone is basically a mini super computer. Smartphones today have more computing power than NASA used to go to the moon in the 1960s. It can play the role of so many different devices in our lives, serving as a telephone, a media player, a camera and well, So so many things.

Our smartphones do so many different things, they are hard to define.

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What does a smartphone mean to us?



But what do they **mean** to us?

This is how we communicate with the people we love, how we capture precious life events and how we access the wealth information in the world.

These are all things that stay more constant than the technology that enables them.



The way we use and understand smartphones is very specific. There are certain rules and conventions your smartphone must follow and many many tasks that it must perform. **It's value is both defined and limited by it's versatility.** There are opportunities that lie outside this narrow context.



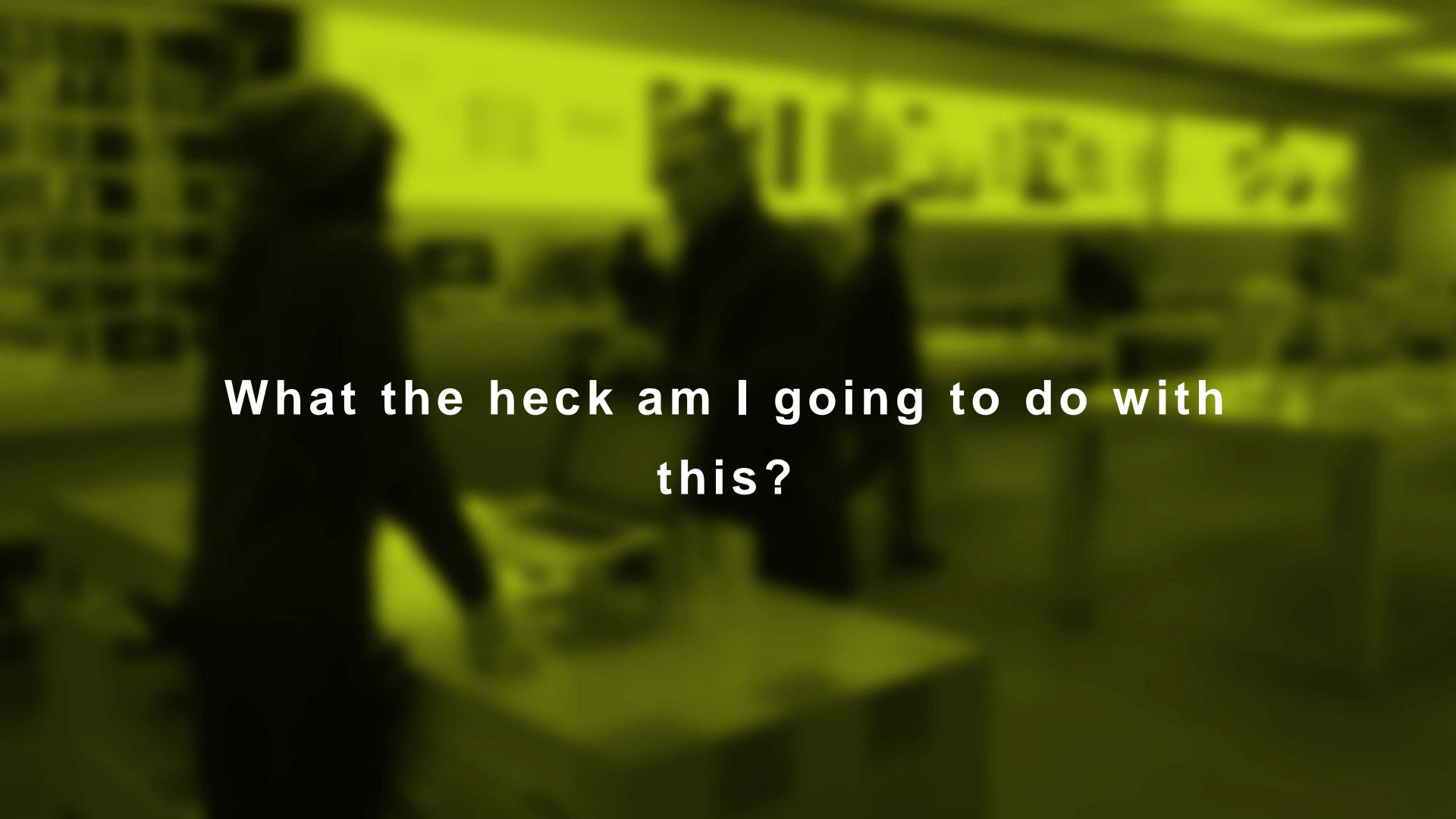
There are tremendous efforts focused around improving smartphone technology. The whole industry is making incremental improvements that better satisfy the specific use case of a smartphone. These improvements entice users to upgrade smartphones long before obsolescence is an issue.



This creates a surplus of devices that have been discarded long before their USEFUL LIFE is over



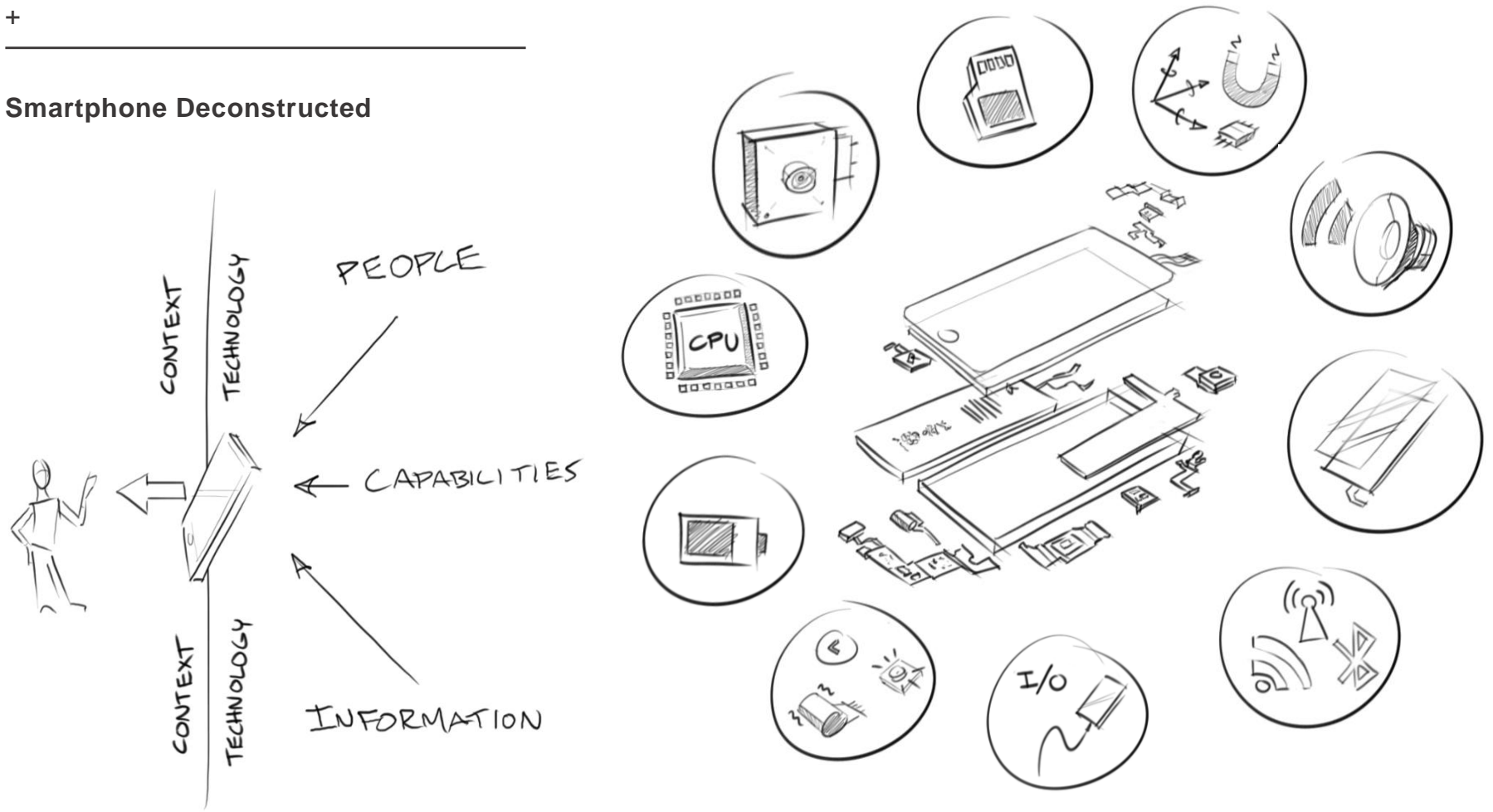
What happens when your smartphone ceases to be a smartphone? You go into your cellular provider, upgrade to the latest version and there is a moment when the cellular service is transferred to a new device.



What the heck am I going to do with this?

When you don't leave home without it, technological sidekick becomes just a block of questionable value and utility. Unless you're maybe a drug dealer or a secret agent, you probably don't need two smartphones. And it's safe to assume that your new smartphone does everything better than your old one. **So what is to become of this misunderstood marvel of technology?**

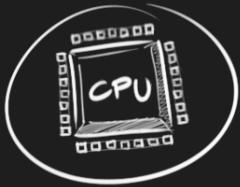
Smartphone Deconstructed



As mentioned before, we understand and interact with smartphones within a very specific context which absolutely limits what the technology can do for us which is, connect us with people, augment our capabilities and give us information. Let's take a look at some of capabilities of a smartphone outside of it's familiar context:

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Isolated & Redefined



By themselves each one of these functionalities is very useful. Combining these together can both enhance and inhibit functionality.


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Isolated & Redefined



What if we were to isolate and combine some of these in different ways? By picking and choosing which enhancements and limitations to leverage, we can achieve any number of distinctly different functionalities and to take this a step further, what if we were to then add external resources like something that's not in a smartphone like a constant power source or a wi-fi signal?

What if we were to also add new components that could be controlled? Like a light bulb or an electric motor?



This project aims to facilitate a broader understanding of the potential role of this technology in our everyday lives.



Previous Work

The idea of repurposing an old smart phone is certainly not unique to this project. There are a bunch of “what to do with your old smartphone” articles and “how to” instructions out there. This is an emerging global trend after all. People find answers to this on their own by handing down their old device or using it as a media device for their kids etc.

I’d like to highlight just a few things that will help shape your perception of what’s out there. Not for just old smartphones, but for current ones as well.

500K+
shipped



GOOGLE CARDBOARD

Experience virtual reality in a simple, fun, and affordable way.



Google Cardboard is a developer API for augmented reality applications, but what really interest me is how they change how information is delivered to the user.

With two inexpensive optical elements for near focus and some cardboard, your phone is **transformed** into an augmented reality headset. This is an incredibly immersive experience enabled by capabilities your smartphone already possesses.

Because this idea is simple and easy to understand, Google has shipped over 500K of these kits.

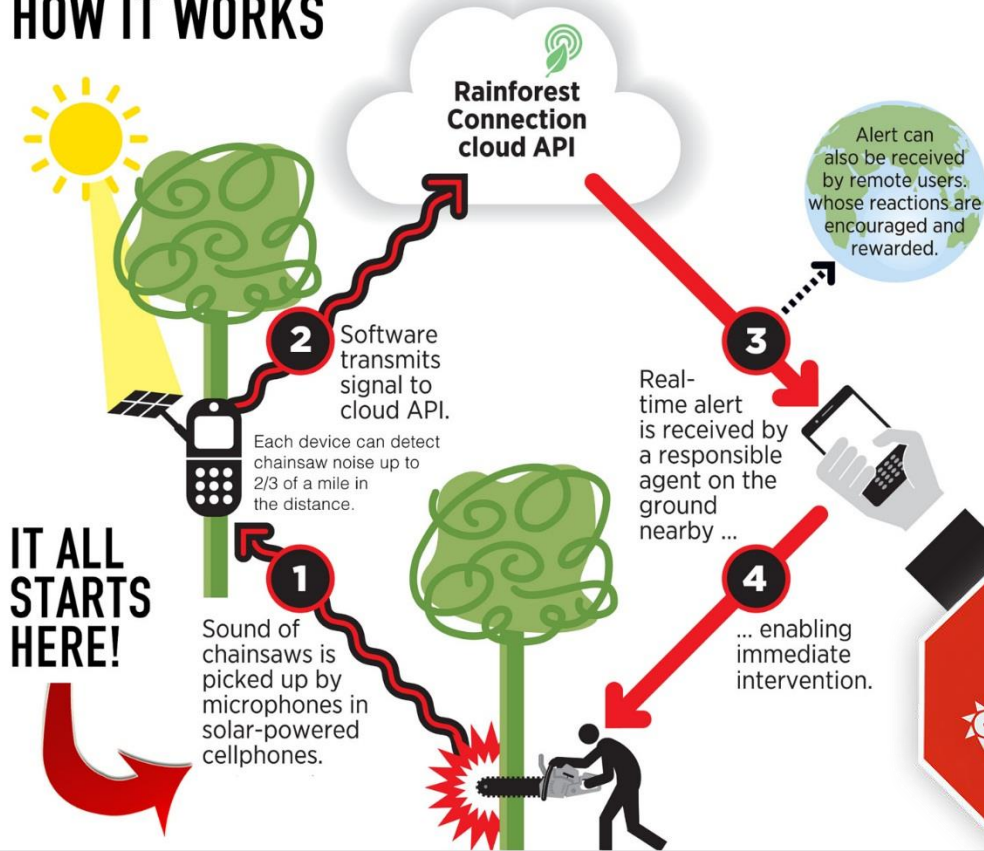


Next we have something called Ryobi phone works. You might recognize the ryobi brand, they make power tools like drills and saws. Phone works is a line that leverages your smartphone to control a series of different sensors like a moisture meter, laser distance meter or even a thermometer. These products leverage what your smartphone can do and then extends it's capabilities using additional parts.

Both Google Cardboard and Ryobi phone works are designed in such a way that your smartphone can easily go back to being a smartphone once your done.

Let's take a look at one far side of the spectrum.

RAINFOREST CONNECTION: HOW IT WORKS



Rainforest connection is an organization that leverages unused smartphones. They tear them apart and add things like solar panels to them.

This is so they can be positioned in various places in the rainforest without a power source. These devices are leveraged for their microphone, connectivity and not much more. They listen for indications of illegal logging operations. Alerts are then sent to people in the area who can respond and stop these operations.

Who knew your old smartphone could save the rainforest..



Trends & Industry Factors

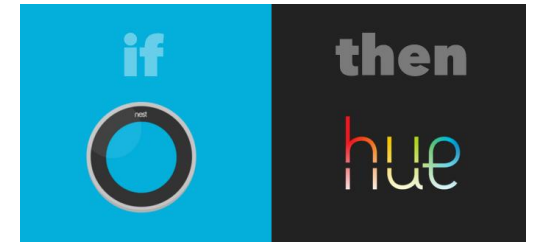
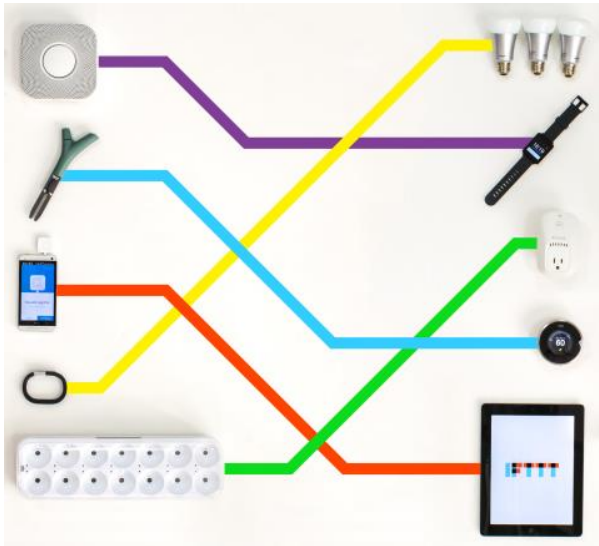


Recipe

if this then that

Trigger

Action



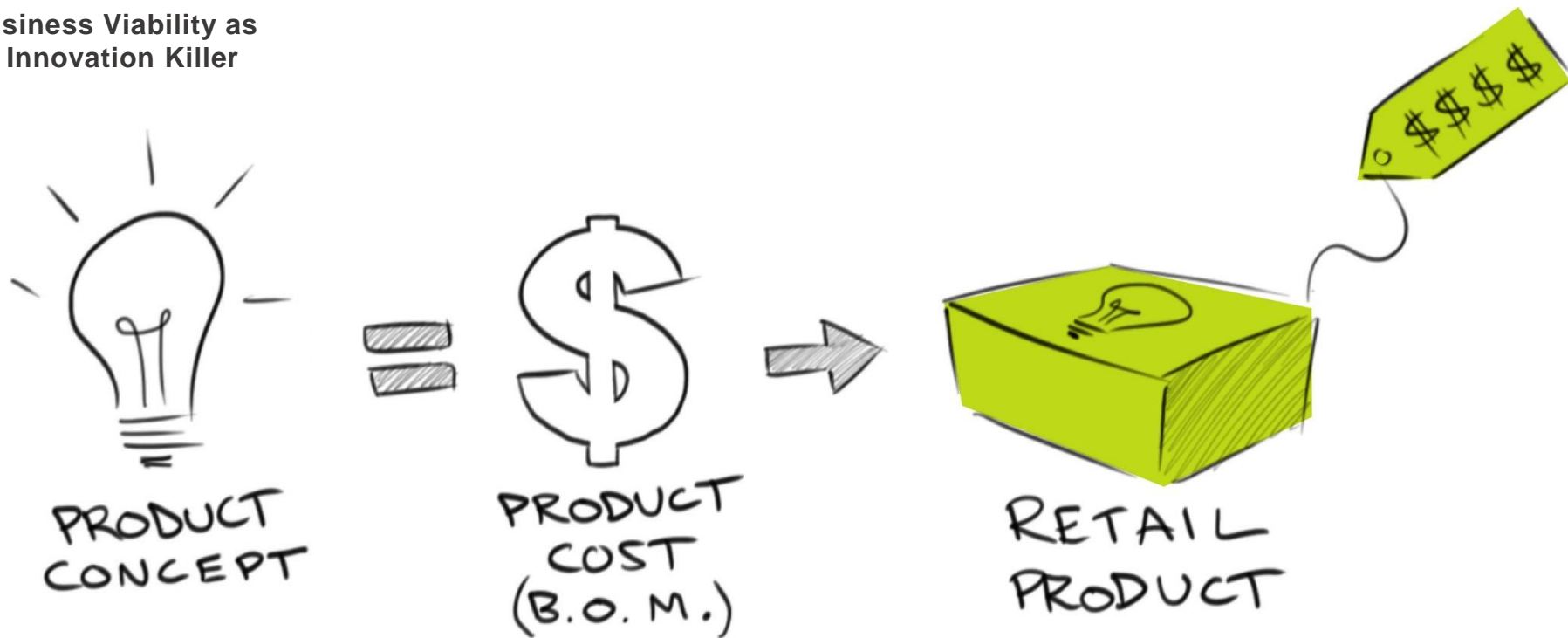
The internet of things, known as the IoT is a network of all connected devices. **Smartphones are a very important part of this ecosystem. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.**

To demonstrate the utility of such a system, let's use IFTTT for some examples. IFTTT stands for if this then that. It is a web app that uses conditional statements called recipes. These recipes contain a trigger and an action.

So IF this happens, the DO that. So if my connected thermostat detects that I'm away, turn off my connected light bulbs. Or if it's going to rain tomorrow, send me an text message.

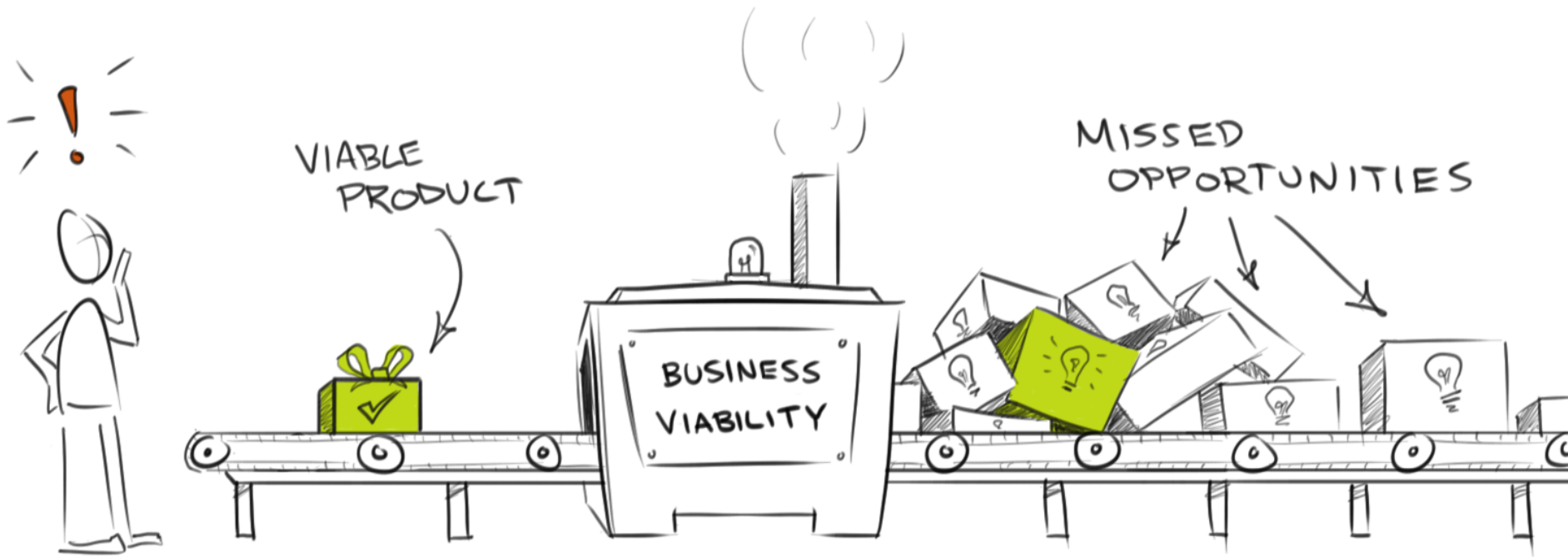
To me, this makes the IoT much easier to understand by focusing on the tangible benefits.

Business Viability as an Innovation Killer




I, personally, have worked in the consumer electronics industry for more than five years. My particular role is to identify new and exciting product concepts to enrich the lives of our users. In my time in this industry and role, I have become very familiar with a paradigm: Just because a product concept makes perfect sense from the perspective of a user, it is not necessarily justified for production from a business perspective. The cost of materials required to build a specific product is referred to as a BOM (bill of materials). This is one major factor when it comes to determining profit margins and the viability of a product concept. The individual costs of components are usually reflected by three to four times in the retail product price. So, if the BOM for a product is \$25.00, then a reasonable retail price for that product would be around \$100.00. Of course there are many other factors that go into pricing, but taking the BOM times four is a good and quick sanity check for a realistic product concept.

Business Viability as an Innovation Killer



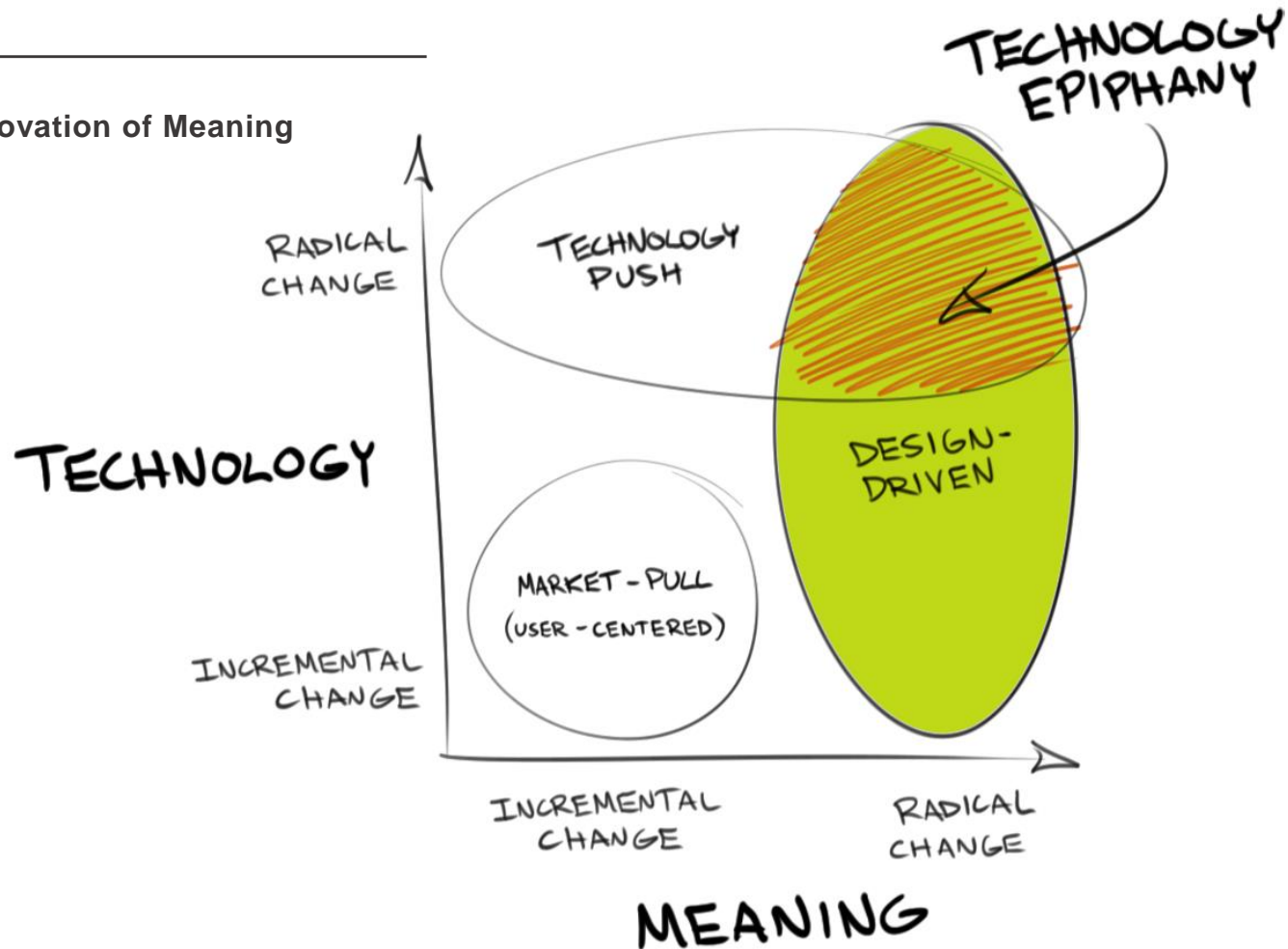
Because of this industry element, I have become painfully aware of the impact every single component, finish and so on has on a final product. If a display in a product costs \$10.00 it will likely impact the retail price of the product by at least \$40.00. In a competitive market such as consumer electronics, this reality plays a big role in what concepts are taken through to mass-production. By leveraging the components that a user may already have in an unused smartphone, there is an opportunity for disruption. For a product concept, say in the category of the IoT, every last sensor, display, antenna and so on, must be accounted for in the BOM and is ultimately reflected in the retail price. This inevitably rules out innumerable product concepts that are both simple and enriching to the lives of its intended users due to poor business viability. By reusing the expensive and sophisticated elements of an already owned, or inexpensive to obtain, device radically alters the business viability equation. Of course, this is easier said than done. The product concept, value proposition and accessibility of the product(s) must be crystal clear and compelling. That is where design thinking can become a very valuable tool for disruption.



How can we foster the creative thinking needed to make smartphone technology more embedded, more elegant and more relatable?

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Radical Innovation of Meaning

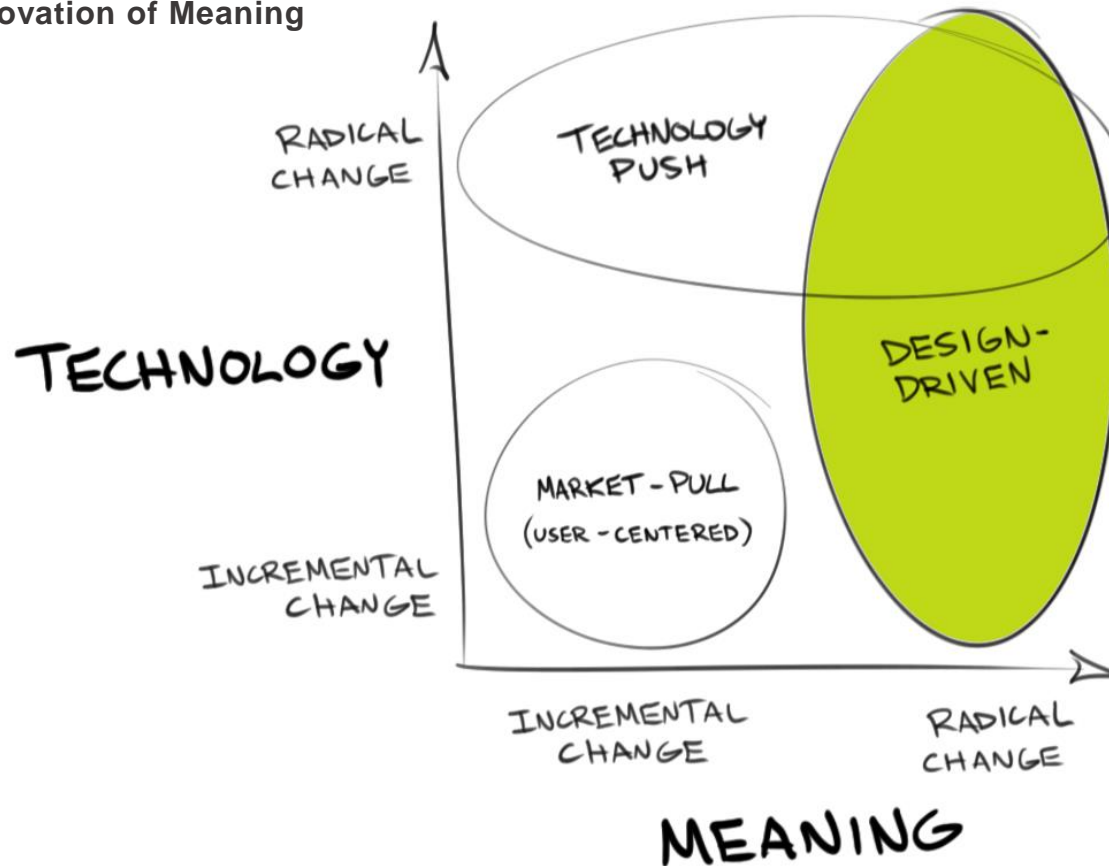


One of the most influential books I read in the Design Management program was Design-Driven Innovation by Roberto Verganti. I find Verganti's approach to innovation to be very applicable for this subject. On one axis we have technological innovation ranging from incremental to radical. And on the other axis, meaning. Also from incremental to radical

If we focus on what users want and are asking for, we will always land in the incremental quadrant because that is what they know and understand.


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Radical Innovation of Meaning



Verganti suggests that we leverage the technological push and propose an entirely new meaning of the technology that they are not already familiar with.

When a radical change in meaning aligns with a radical change in technology, he calls it a **technology epiphany**. That is exactly where this project is focused.



Design can be used to speak directly to the user in a new and exciting way, facilitating an immediate visceral understanding.

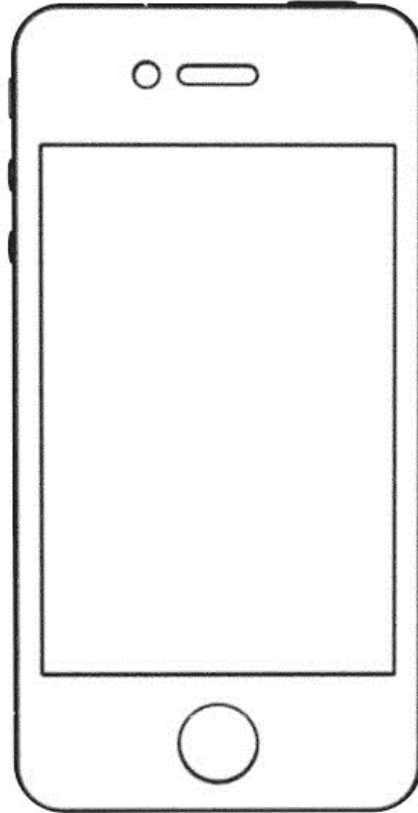


You're probably familiar with the Nest learning thermostat. I chose to show this because it's a popular device and it's part of the internet of things. It learns when you're home and your climate control preferences and helps improve your home's energy efficiency.

I have one and it's pretty cool, but it was \$250 bucks!

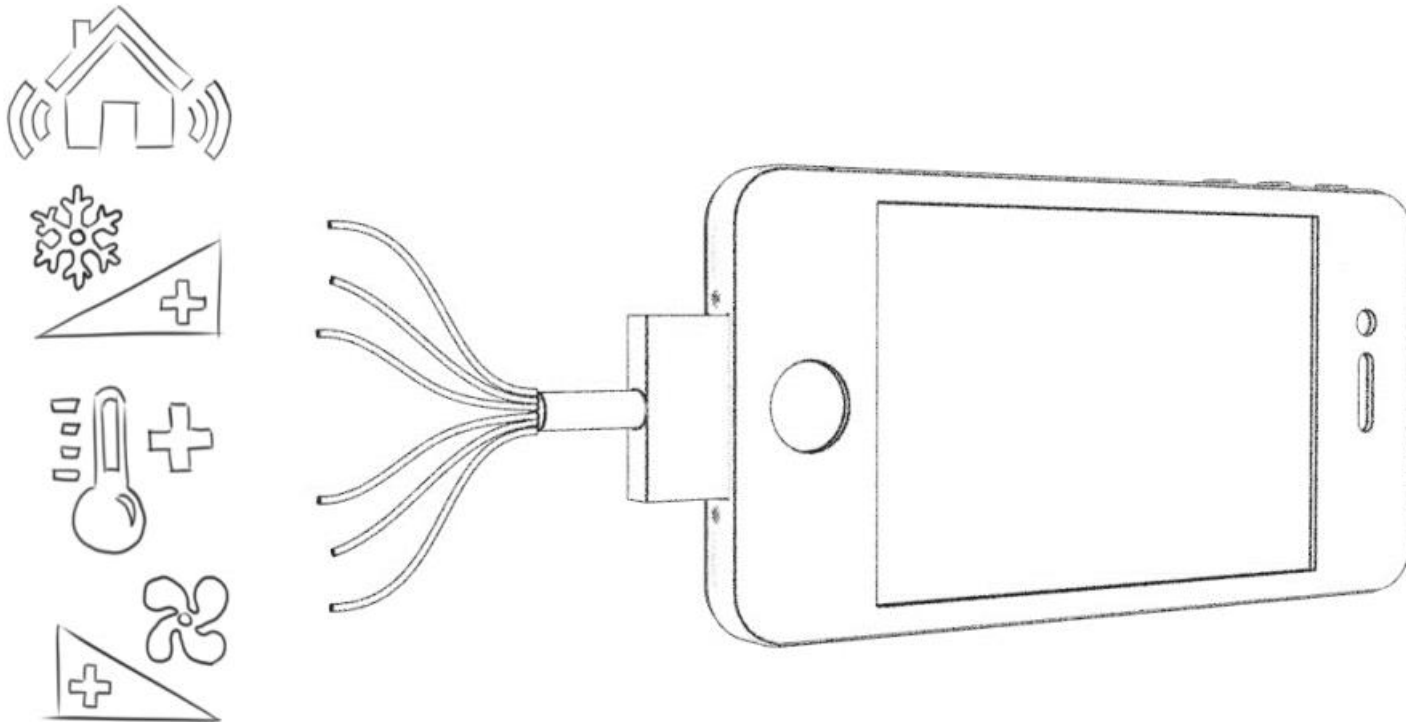
That's partially due to the fact that has many expensive components like a display, proximity sensor etc.

That is the price required for a product with business viability.



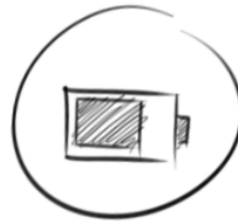
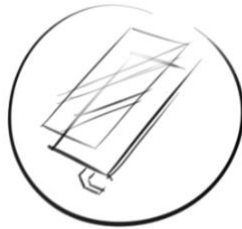
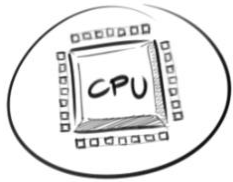
Smartphones share a lot of the same features as the nest. For instance, they have a display, several input methods, a proximity sensor and the ability to connect to wi-fi

So what would it take to transform an unused smartphone into a smart thermostat?



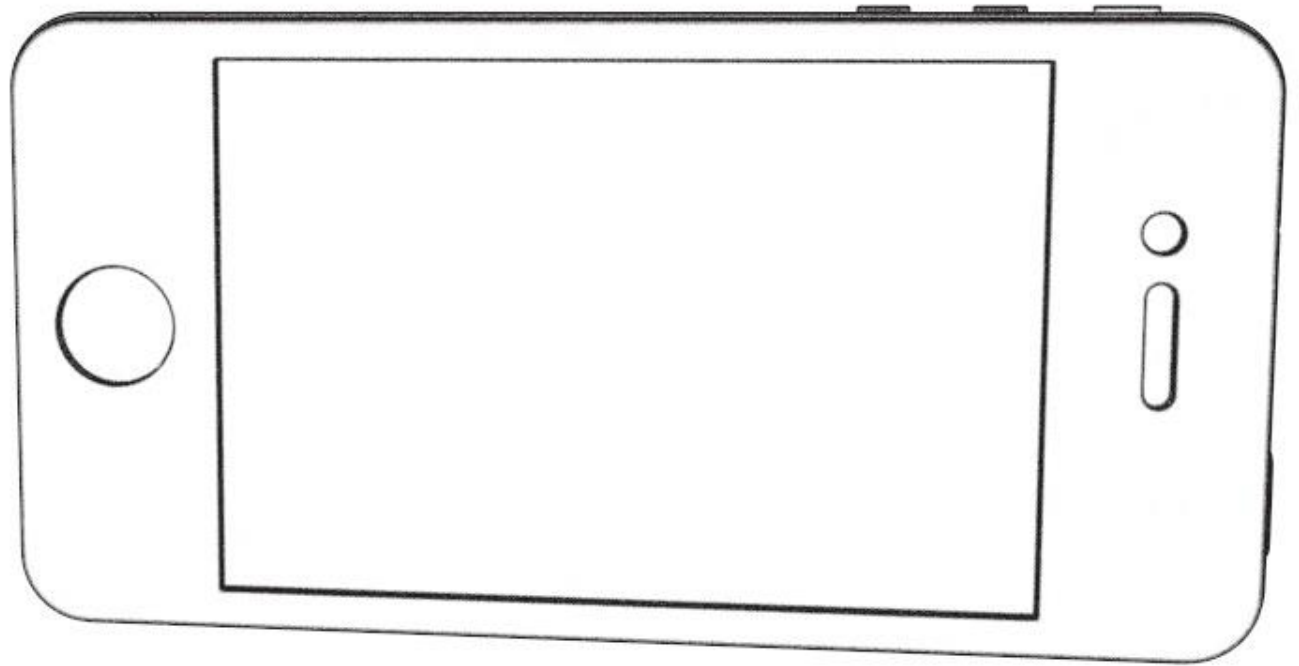
Well, I'd say the biggest missing element is a way for the smartphone to interface with the appliances in your home.

If we could create a way for a smartphone to interface with your home like a thermostat, we might be getting somewhere.



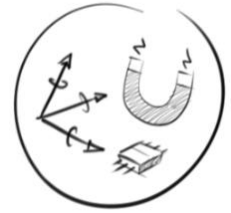
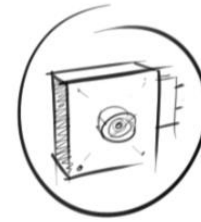
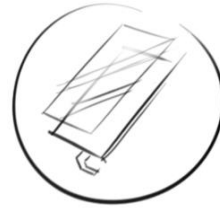
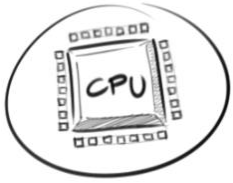
So here is an example of how we can leverage several “ingredients” of a smartphone while disregarding a few others to alter it’s perception and utility.

You might be thinking this still looks a lot like a smartphone in a box because we’ve left a lot of the recognizable features intact. So let’s take the abstraction a step further.



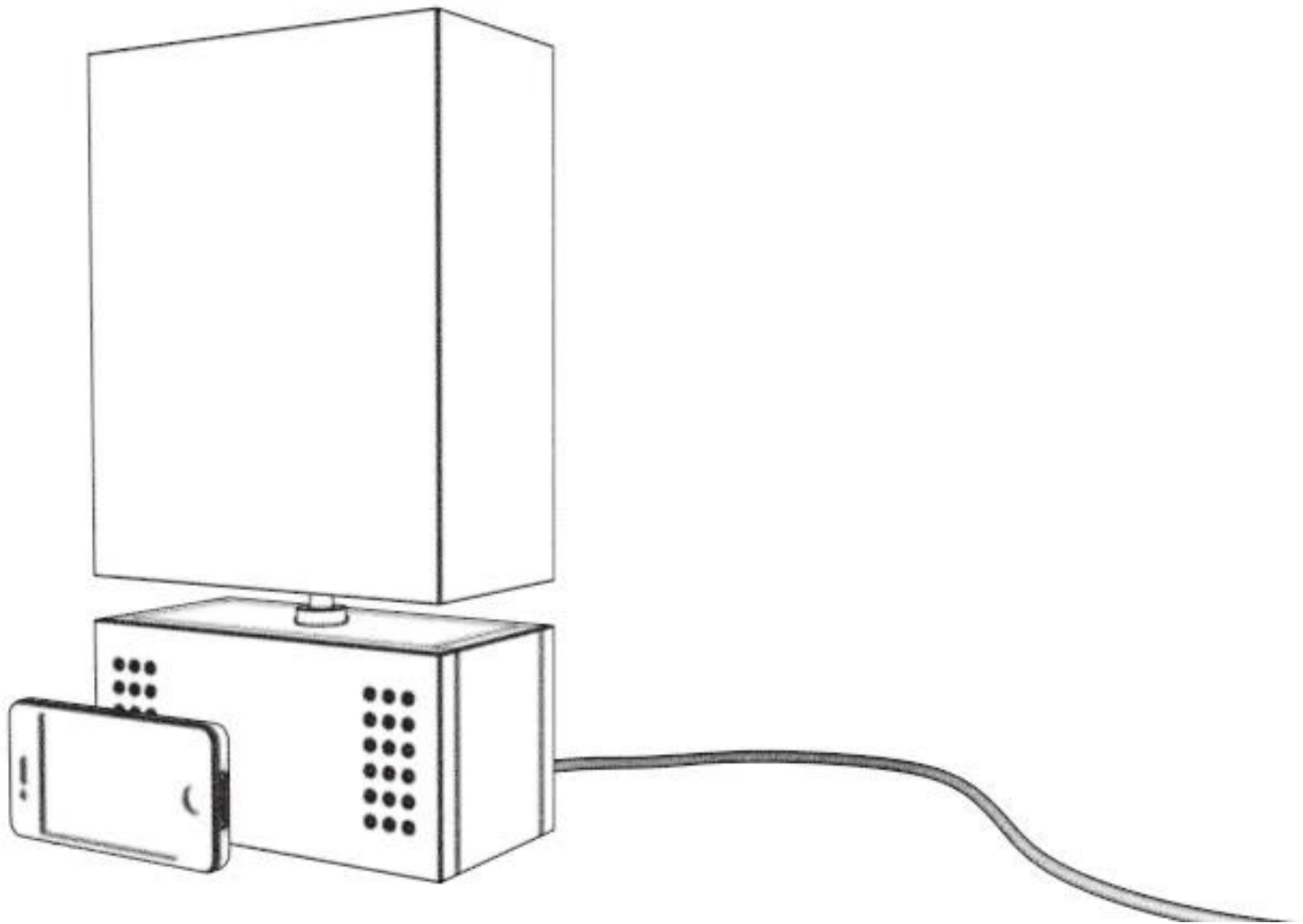
These things have big beautiful displays so a first instinct might be to use every last bit of the display for any application.

But what if a certain abstraction only needed part of the display?



Here we have a high fidelity sound system with a beautiful touch screen display and it's wi-fi enabled and is hardly recognizable as a smartphone accessory. Because this is intended as a dedicated device, we don't need easy access to take the smartphone in and out of the unit.

So again, we've taken a few key ingredients from the smartphone and facilitated an interface between any missing piece, in this case, that's the speakers and amplifier. But this device still has plenty of other functionality that we have chosen to ignore.



If we push the boundaries of how to use some of these other ingredients, we can change the meaning of a standalone music player. It's this abundance of optional and "free" functionality that is so exciting and out of reach for any brand new product in this category.

So what if we didn't need the display at all?

Give this thing a way to interface with a light fixture and a constant power-source and boom, you have an internet connected lamp!



We're using just a few ingredients to add new value to this product, but what other exciting and elegant functionality could be added to a concept like this?

For example, it could double as a security camera or facilitate access to google voice search with a simple wake-up phrase.



Next Steps: HackerMade



All of these ideas only begin to scratch the surface of what could be. This project was not about the specific concepts I just showed you but rather the excitement creative state of mind they have hopefully guided you to.

Hackermade is a brand and startup concept I intend to pursue after graduation. I cannot do this alone because I'm limited by my own background and abilities. I need a team.



The most important element for collaboration is a shared passion and vision.

I will be using this research as a jumping off point for Hackermade.

This gives me everything I need to jumpstart the creative thinking needed for this initiative and a few examples to get everyone excited around a shared vision and design language.