

The background features four large, stylized yellow shapes in the corners, resembling thick, rounded L-shapes. The top-left and bottom-right shapes are hollow, while the top-right and bottom-left shapes are solid yellow. The main title is centered in a bold, dark grey font.

PROMOTING THE CULTURE OF REPAIR

Kasra Tayebi
Spring 2017
Rapid Prototyping

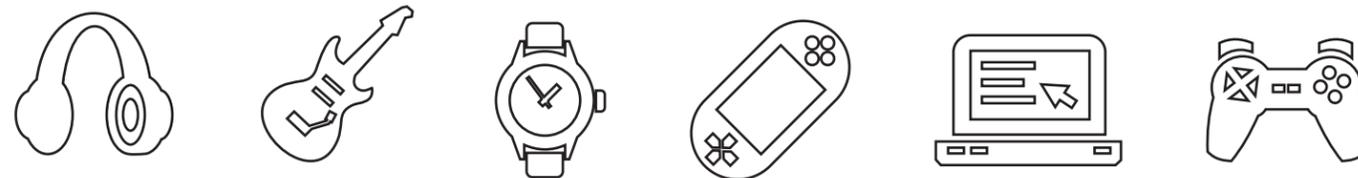
WHY REPAIR?

“

The useful life of consumer electronic devices is relatively short, and decreasing as a result of rapid changes in equipment features and capabilities. This creates a large waste stream of obsolete electronic equipment, electronic waste (e-waste).

Even though there are conventional disposal methods for e-waste, these methods have disadvantages from both the economic and environmental viewpoints. As a result, new e-waste management options need to be considered, for example, recycling. But electronic recycling has a short history, so there is not yet a solid infrastructure in place.”

Electronic waste recycling: A review of U.S. infrastructure and technology options / Science Direct



PLATFORM21

Platform21 is "a platform for people curious about the future." They organize exhibitions and lectures from an old chapel in Amsterdam. Their current project, launching on March 13, is one dear to our hearts: Repair, not recycle. Their manifesto is written to inspire designers and consumers, and to "start a movement."

HOW TO APPROACH REPAIR?

<https://www.disegnodaily.com/article/repair-and-the-culture-of-fixing>



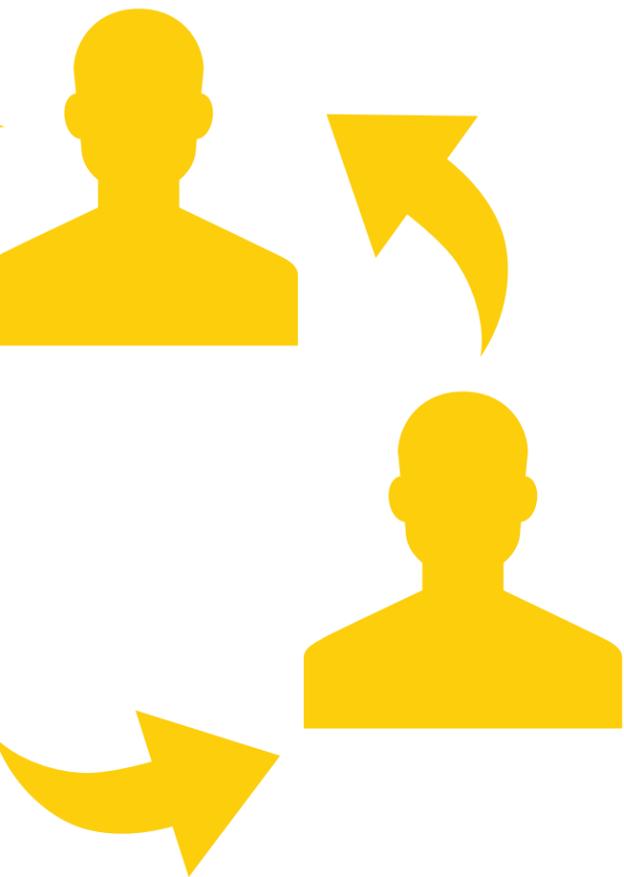
RECYCLING vs REPAIRING

E-Waste by the UNIT in 2010 – Was it Trashed or Recycled

(Same report as above, but reported in UNITS, not by TONS)

Products	Total disposed**	Trashed	Recycled	Recycling Rate
	Units	Units	Units	%
Computers	51,900,000	31,300,000	20,600,000	40%
Monitors	35,800,000	24,100,000	11,700,000	33%
Hard copy devices	33,600,000	22,400,000	11,200,000	33%
Keyboards and Mice	82,200,000	74,400,000	7,830,000	10%
Televisions	28,500,000	23,600,000	4,940,000	17%
Mobile devices	152,000,000	135,000,000	17,400,000	11%
TV peripherals*	Not included	Not included	Not included	Not included
Total (in units_	384,000,000	310,000,000	73,700,000	19%

<http://www.electronicstakeback.com/>



IS THERE A CULTURE?



<http://www.loctiteproducts.com/img/applicati on-super-glue-bottle-long-nozzle.png>



IFIXIT

“

iFixit is a wiki-based site that teaches people how to fix almost anything. Anyone can create a repair manual for a device, and anyone can also edit the existing set of manuals to improve them. Our site empowers individuals to share their technical knowledge with the rest of the world.”

ifixit.com

26,152
FREE MANUALS

101,233
SOLUTIONS

7,866
DEVICES





Repairability: 7 / 10

Amazon Echo Repair

A Bluetooth smart speaker by Amazon, announced November 6, 2014. The Amazon Echo features a voice-activated cloud-based assistant that can manage various tasks including playing music, reading news, creating lists, and answering questions.

[+ Create a Guide](#)

Featured Guides



Amazon Echo Tweeter Replacement

Replace the tweeter in the Amazon Echo.

6 Replacement Guides

LED/Microphone Board



Motherboard



Power and Speaker Driver Board



Tweeter



Tweeter Assembly



Woofer



WIKI BASED SITE

https://www.ifixit.com/Device/Amazon_Echo



HOW TO REALLY FIX OBJECTS?



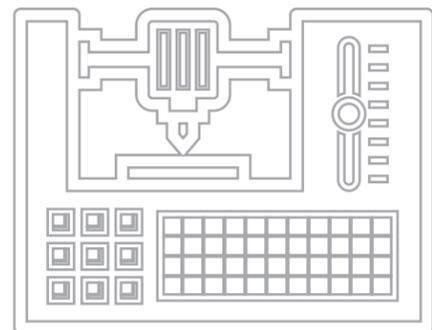
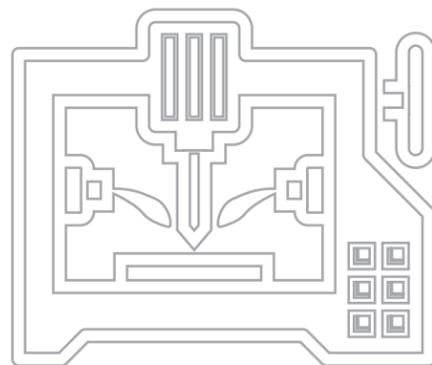
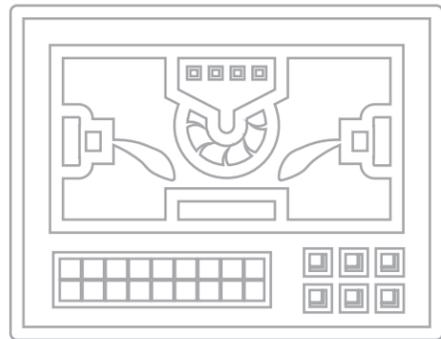
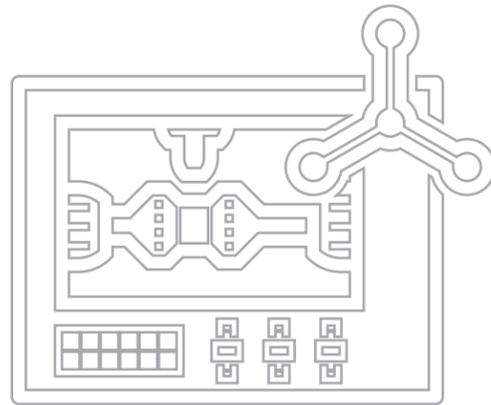
**CAR STEERING
WHEEL BUTTON
<~400\$ REPAIR COST**

INTRODUCING ∨



iPRINTit

**PROMOTING
THE CULTURE OF
REPAIR**



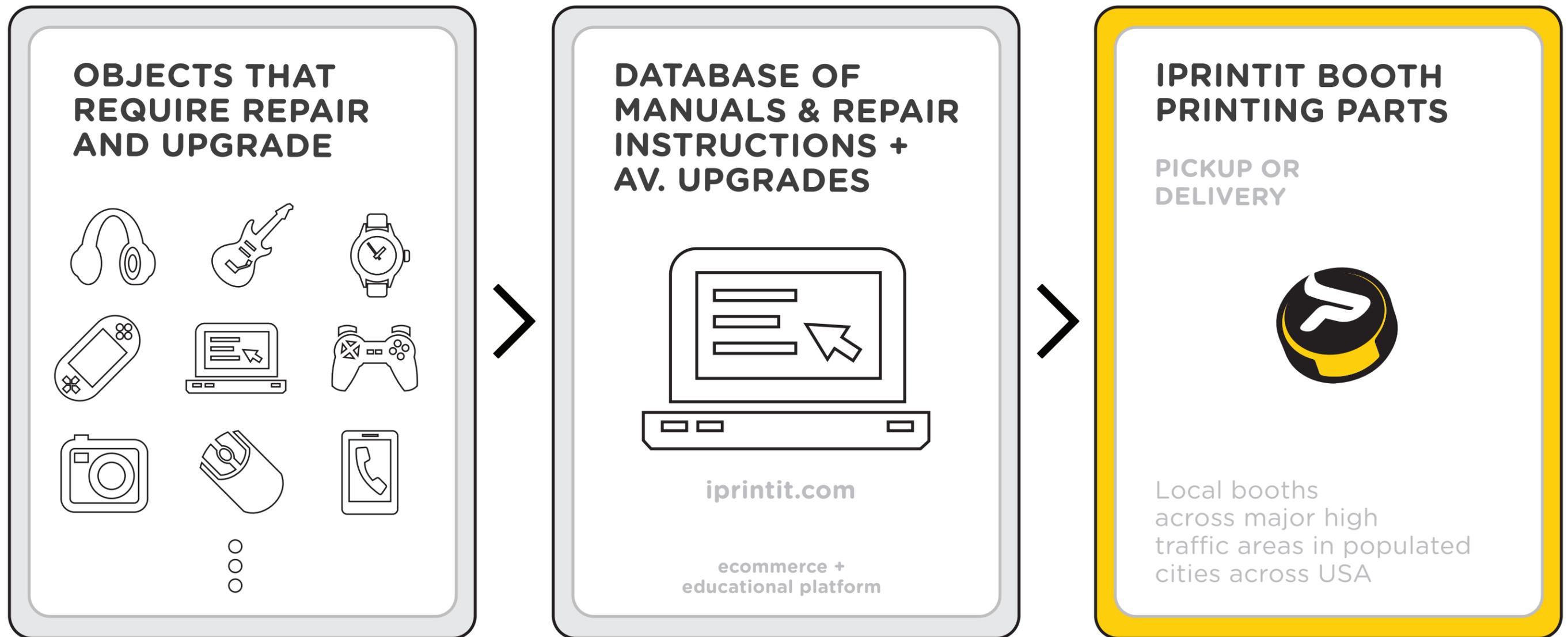
A 3D SCANNING /PRINTING SERVICE

iPrintit is a concept model to provide scanning and 3D printing services for the main purpose and goal of repairing /upgrading everyday objects.

TECHNOLOGIES ∨
SLA, SLS, DLP, FDM, ...



HOW IT WORKS?



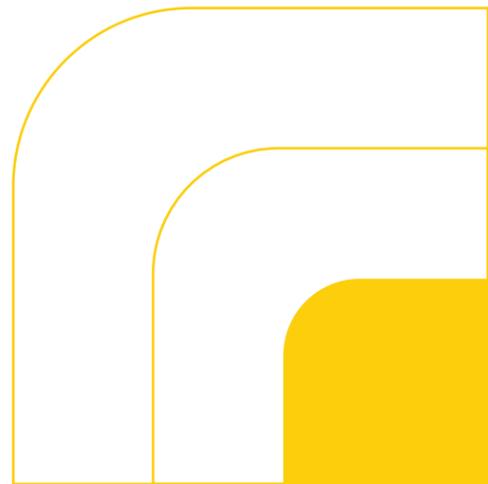
WHAT WE DO

✓
WE 3D SCAN
DEVICES & MAKE
3D MODELS FOR
ONLINE DATABASES

WHAT USERS DO

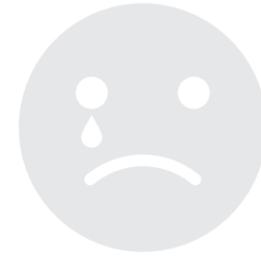
✓
USERS ORDER
PARTS ONLINE
AND CHOOSE THEIR
METHOD OF DELIVERY

>  COST EFFECTIVE SOLUTIONS TO
REDUCE WASTE & PROMOTE
THE CULTURE OF REPAIR

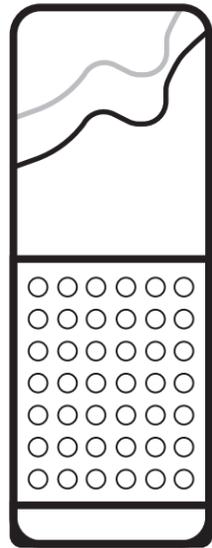
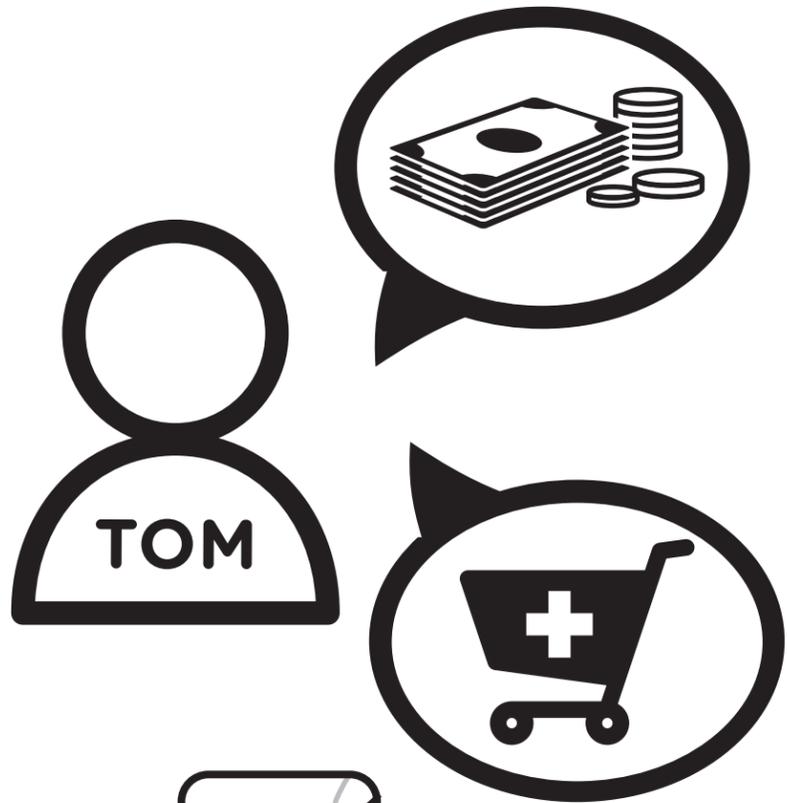


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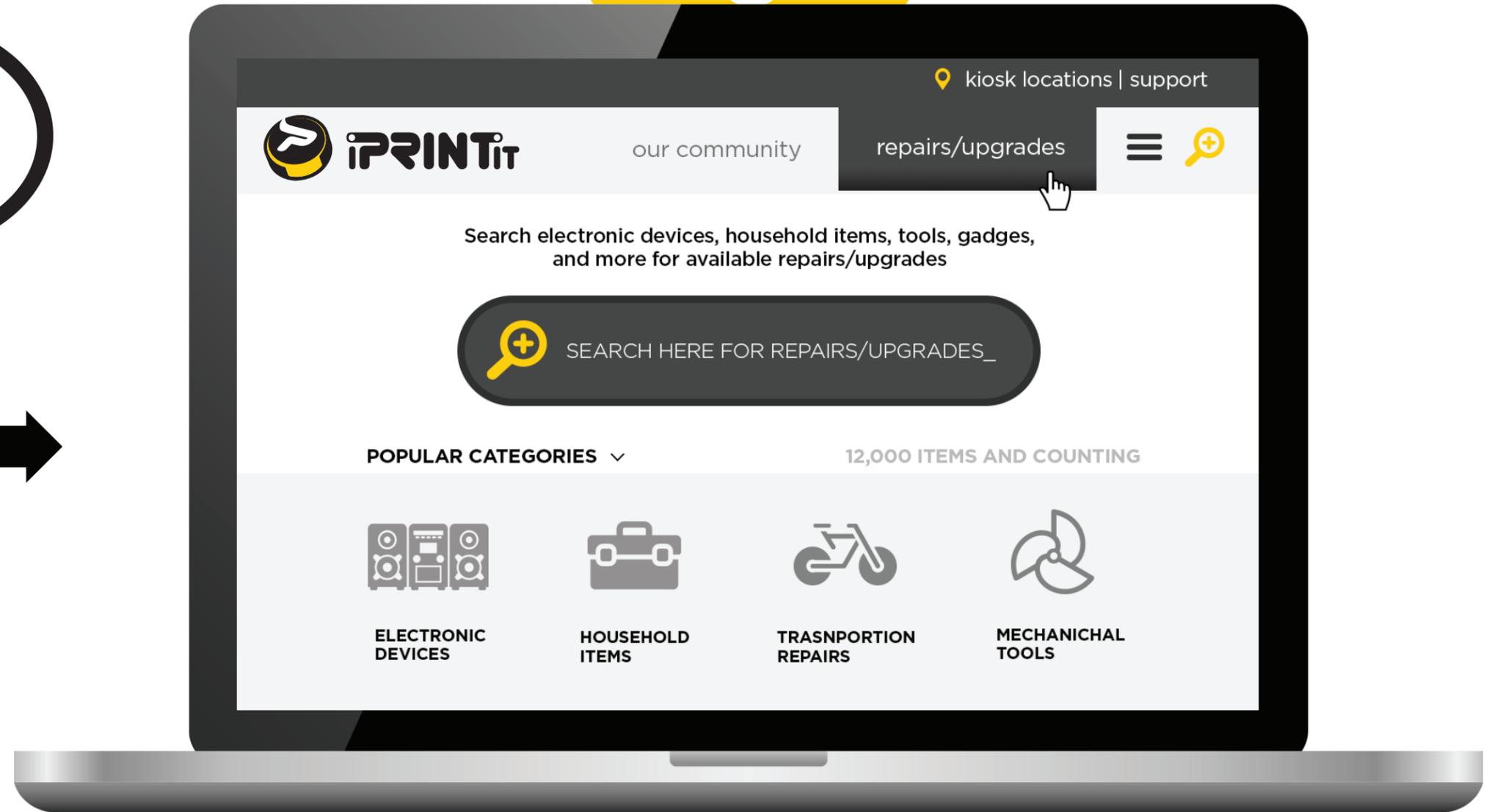
**CASE STUDY
EXAMPLE
/REPAIR**



WHAT DO
WE DO WHEN
SOMETHING
BREAKS?



**BROKEN
AMAZON
ECHO**
NEW > \$180

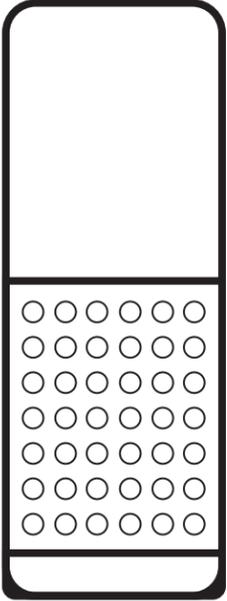
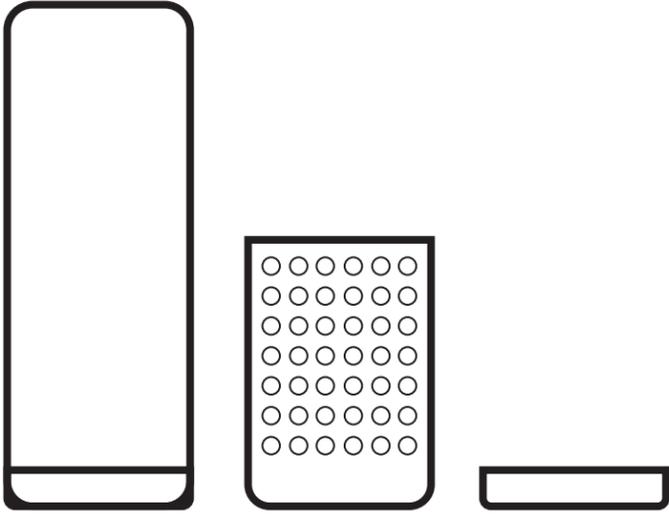
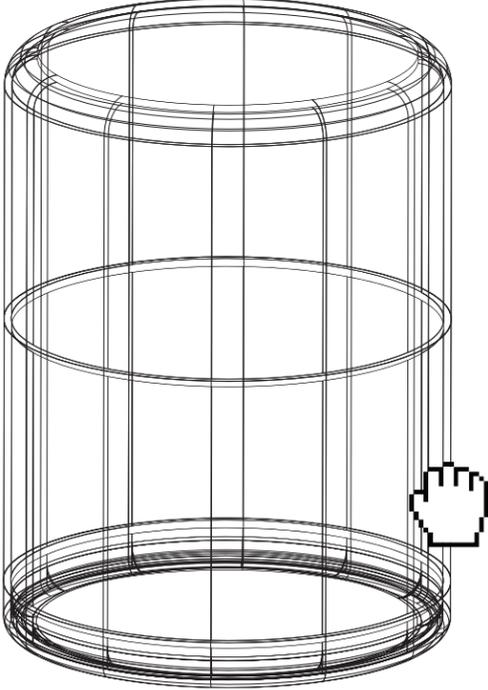




SEARCHED FOR AMAZON ECHO_

AMAZON ECHO AVAILABLE PARTS



 <p>MODEL#</p>	<p><</p>  <p>A B C ...</p>	<p>B</p>  <p>\$8<</p>	
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2

**CASE STUDY
EXAMPLE
/UPGRADE**



PERSONALIZATION
CUSTOMIZATION
FOR DAILY OBJECTS



**UPGRADE
GAME CONSOLE
CONTROLLER**





SUMMARY

In order to create a culture within our society that respects the environment in addition to technologies, efforts, and manpower that goes into making everyday objects, we need to be able introduce new ways in order to increase the lifespan of these everyday objects by being able to repair or upgrade them. **IPRINTIT** makes this possible!



RESEARCH REPORT

INTRODUCTION

3D printing and scanning has been developed and progressed over years, however the importance of applications and usefulness of these technologies has not yet have a significant place in an average person's daily life. With several attempts from the industry in order to reduce the cost of these printers and scanners for an average consumer, there is still a need to justify a normal consumer in order to buy the commercial versions and get benefits from them. Furthermore, these technologies are available for any consumer to get advantages from, but the notion of limited applications of these home devices are still debatable because usually the limitations are associated with materials, quality, objects dimensions and so on. In addition, an average consumer requires to have a basic knowledge in order to operate these machines and in most cases a basic knowledge of 3D printing and scanning with a 3D software is required. Although users can download 3D files and produce physical objects with the help of 3D database sources such as Makerbot's Thingiverse and GrabCad websites with minimum knowledge, these website databases are not designed around daily interactions and only provide random 3D files that are produced by different people around the world. This from one hand suggests that mostly designers and engineers are the users for these websites rather than average consumers. And on the other hand, the lack of providing useful 3D files for daily interaction and most importantly repairing existing devices has been excluded and ignored in these databases. In this case, based on the facts above, I am going to explore the possibilities of providing a 3D printing and scanning service that really benefit users in their day to day life by providing repair and upgrade services in order to fix and customize objects that people interact with daily.

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STATISTICS AND BACKGROUND

According to Electronic waste recycling article at Sciencedirect.com "the useful life of consumer electronic devices is relatively short, and decreasing as a result of rapid changes in equipment features and capabilities. This creates a large waste stream of obsolete electronic equipment, electronic waste (e-waste) (Kang, Schoenung, 2005). This means as the technologies are expanding exponentially we truly need to take action in order to take responsibilities related to waste management and pollution. In fact according to another article at electronicstakeback.com in most cases the recycling rate is on average around 11% and the rest is trashed. In this same article research shows "to manufacture one computer and monitor, it takes 530 pounds of fossil fuels, 48 pounds of chemicals, and 1.5 tons of water" (electronicstakeback.com Facts and Figures on E-Waste and Recycling). These figures are also at the same rate when we take a pick at other daily objects such as a toothbrush or a hairdryer. So what is the solution? Are there any current cultures in communities around the world that support repairing as a better solution? Many of the corporation around the world are not really engaged with providing cost effective solutions in order to repair objects and simply they ignore the facts associated with waste management and sustainability. According to IEEE Spectrum "in 2014, semiconductor production facilities made some 250 billion billion (250 x 10¹⁸) transistors. This was, literally, production on an astronomical scale" (Hutchenson, 2015). This fact shows the need for technology, and the devices that are running based on it are increasing, however there are fewer solutions to how to control them in the future in terms of their lifecycle.

In this case, repair is always a better solution for both customer and the environment. With current technologies of 3D printing and scanning there are benefits and potentials that can help to address these issues. But how can someone get benefit of easily repair or upgrade a broken or unused device or an object? How can 3D printing be more useful in our daily lives? What are the immediate applications of using such technologies? These are in fact some of the main questions that anyone could ask about 3D printing and scanning while they step into exploring the possibilities of the applications of these technologies in their daily lives. The answer to these questions could be subjective by users occupation and their purpose of investigating into these technologies such as making new objects or study models for experiments, having fun making new things, and further research. However, one the helpful aspects of having 3D printing and scanning devices which has not yet been fully developed by the modern society is to use these devices as small manufacturing machines for producing parts that are relevant for repairing day to day devices such as kitchen equipment, electronic devices and so on. In this case, the 3D printing technologies for example can be far more beneficial for an average user because of that immediate need of repairing for the object that they interact with daily. In many cases, in case of a device repair situation users really look into the cost and economics behind the object that needs repairs. If the object is not 'beyond economic repair' they usually consider to repair it but in fact most of the electronic devices such as kitchen equipment and other electronic devices do not have repair services available and mostly devices that are aged more than couple of years are not considered repairable and they finally end up in junk yards before their retirement as a result of no available repair options. In other words, using these technologies would make more sense for an average user in day to day applications such as repairing objects at home or things related to their transportation such as bikes or cars.

The iPrintit service is a business concept model to provide scanning and 3D printing services for the main purpose and goal of repairing everyday objects for users. This service allows users to login to a web based portal and search for their desired devices that they need to repair. Upon a successful search result from the

iPrintit database the user is now have access to the different scanned parts of the device or tool that they are trying to repair. They can identify which parts of their device needs repair and accordingly can select the 3D parts from the selected model and send them for printing. The actual printing side of this service is going to be provided by kiosks across major cities such as Downtown Phoenix or Los Angeles. The individual 3D booth can include four different 3D printers (SLA, SLS, FDM, DLP) to produce different materials and textures. These printers can take users orders and with a help of a supervisor at the specified kiosk location the 3D replication process can start. Later on users can select the option to get their printed part delivered or they can simply pick it up if they schedule it for a pick up at their nearest iPrintit kiosk location.

We can approach the iPrintit scanning service from different viewpoints. First is the in house approach which includes staff in order to scan objects and requires scanning devices. In fact, many devices can turn a physical object into a digital 3D model. In industry high resolution scanners such as Rexcan™ can capture a form of an object by placing it on a rotatable turntable surface that places it in front of a head that features two cameras and an LED light source. Alternatively to scan large objects that can not be placed on a turntable other high-end scanners such as Artek can come to play. It is also possible to scan objects in a custom built scanning booths fitted with a large number of digital SLR cameras. In this case, by photographing an object from all the angles with a set of 36 images or more based on different positions, and with the help of using softwares such as 123D Catch and Meshmixer from Autodesk™ we can develop semi accurate digital 3D files which can be later 3D printed by variety of available methods at iPrintit booths.

The other method would be to approach this by taking a closer look at the current services that other companies such as iFixit are offering. "iFixit is a wiki-based site that teaches people how to fix almost anything. Anyone can create a repair manual for a device, and anyone can also edit the existing set of manuals to improve them. Our site empowers individuals to share their technical

knowledge with the rest of the world” (ifixit.com). At iFixit, specialized staff (or ordinary people) take things such as electronic devices apart in order to show them on their website for people to get advantage of repairing them and study how they were made. However, most of these devices usually are not supported from manufacturers for small repairs or replacement of broken parts and materials, that therefore making repairs challenging and frustrating.

In this scenario iprintit can offer to partnership with ifixit in order to 3D scan all the parts of the electronic devices or tools that they take apart, and save them as STL files and later provide them as libraries and databases of 3D files for scanned objects at the iprintit website library. In this case, members can access the parts they need for their devices online and can print them at their local iprintit kiosk near them.

SCENARIO A - REPAIRING

In this scenario I am going to explore the possibilities of repairing devices from the perspective of an average user (John Doe) needing repair assistance.

In this case, John is currently holding a ChromeCast device that has a broken shell. The average cost for this device on the market is around 35\$ and John can easily buy another one and trash the broken one. However, iprintit can provide a better cost effective solution with providing home run repairs. In this scenario, John goes online at iprintit.com* (proposed URL) and searches for ChromeCast devices and selects the one that represents the model that he is holding. Then the website is going to ask for some basic information about what he is trying to repair or in what kind of situation his device is currently in, in order to provide detailed information regarding repair process and the parts that need to be replaced. One of the most important factors of this process is going to be the technology that responds to the level of repair that needs to get done for the user. In this case, the website is going to ask John to upload a set of images from their current broken device to the website. Then the website can investigate the amount of damages that are done and based on internal program

algorithms provide suggestions to the user for parts that needs to be printed and replaced.

The website also provides detailed information about how to approach this repair and provides John with the option to also choose tools such as screws and screwdrivers to get printed and provided along with the repair process. The final step is for John to select the method of delivery (pick up at the location or courier) and starting the repair process at home.

The whole cost of this process for the user would be much less than buying a new replacement device and could potentially saves them money as well as educating the public for promoting the culture of repair.

SCENARIO B - UPGRADING

In scenario B, John is looking to see what options are available if he wants to for example customize or personalize some of his electronic devices and tools. In fact, iprintit website can provide different upgrades for variety of electronic devices beside regular device repairs. In this case, general appearance upgrades for certain objects could eventually make them more special to the eyes of their users.

For instance, John can search for upgrades and designers choices that are available for his PlayStation4 controller or just simply search for designer upgrades for his HD2595-Philips Toaster! Although the procedure here would be a bit different than the previous scenario of repairing, the website can still offer how to begin the process of upgrading by providing detailed information about the entire experience. Here John can select his desired upgrade and select the kiosk near him at the final step to order the upgraded parts and later installing them at home. He also have an option to send back the older plastic upgraded parts to iprintit office for collection and recycling.

SUMMARY

In order to create a culture within our society that respects the environment in addition to technologies, efforts, and manpower that goes into making everyday objects, we need to be able introduce new ways in order to increase the lifespan of these everyday objects by being able to repair or upgrade them. In this case, not only the relationship between the user and the object increases but also if immediate repairs are available users would be more motivated to keep using and upgrading their current devices. The iPrintit service provides this unique opportunity at the age of 3D printing and scanning technologies in order to fulfill the repair needs of average consumers. The two part service includes partnership or inhouse models for scanning variety of everyday objects and placing them into a database for users to select from, as well as a physical kiosk booth across major cities for 3D printed parts for pick up or even delivery. The process of repairing and reinstalling these devices at home will all be documented at the iPrintit website with addition for even providing 3D printing required tools for the repair process at home so that the process of buying extra tools for the repair process is eliminated, proving users with a better overall repair experience.

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