26% of iPhones break within 24 months

10% of people have an accident with their iPhone within 12 months

Many break something other than the glass: button, speaker, vibrator, etc.

Data: Squaretrade 2010
Over 100 million iPhones are ready for repair.

[Bar chart showing cumulative units sold worldwide (millions) from Q3 2008 to Q3 2013.]

Data: Apple, iFixit estimates.
Repair 1.0
1990

How to be a mechanic

Figure it out
Printed repair manuals
Trade school
Xbox One Kinect

TEARDOWN
We are an online community of people sharing repair know-how.

iFixit makes it:

**Easy** for anyone to share repair knowledge **Simple** for people to fix their devices.
Our manuals are all Open Source
“The Repair World’s R&D Department”
iFixit Has a Real Impact

- 10 years of experience training and supporting thousands of repair businesses
- 3.5 million monthly tech-savvy, affluent visitors
- Technical, business, and supply chain expertise to handle hundreds of thousands of repairs
- Largest volume iPhone parts and tools supply chain
- Tool supplier to Geek Squad, Radio Shack, and FBI
- Battle-tested technician training materials
91% Told us that iFixit has enabled them to perform repairs they wouldn’t have done otherwise.

95% say that a successful repair makes you more likely to buy another product from that manufacturer.

7 Average number of things people have fixed using iFixit.
I travel throughout Africa and Asia documenting electronics recyclability and e-waste disposal practices.
E-waste is the Toxic Legacy of our Digital Age

Our waste electronics are polluting drinking water and harming ecosystems around the world. It’s time to fix the problem.
# Tablet Repairability

Our engineers disassembled and analyzed each tablet, awarding a repairability score between zero and ten. Ten is the easiest to repair.

## How we rate devices:

A device with a perfect score will be relatively inexpensive to repair because it is easy to disassemble and has a service manual available. Points are docked based on the difficulty of opening the device, the types of fasteners found inside, and the complexity involved in replacing major components. Points are awarded for upgradability, use of non-proprietary tools for servicing, and component modularity.

<table>
<thead>
<tr>
<th>Device</th>
<th>Rating</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell XPS 10</td>
<td>9</td>
<td>Easy to open. Easy to remove battery. Color-coded screws and labeled cables inside. LCD is fused to the glass.</td>
</tr>
<tr>
<td>Amazon Kindle Fire</td>
<td>8</td>
<td>Device is easy to open. No proprietary fasteners. Simple design with standard Phillips screws. Glass panel is fused to frame.</td>
</tr>
<tr>
<td>Dell Streak</td>
<td>8</td>
<td>Device is easy to open. Battery is easy to replace. LCD is fused to the glass.</td>
</tr>
<tr>
<td>Motorola Xoom</td>
<td>8</td>
<td>No proprietary fasteners. LCD and front glass are not fused. 57 screws means a long disassembly time.</td>
</tr>
<tr>
<td>Samsung Galaxy Tab 2 7.0</td>
<td>8</td>
<td>Modular design and easy to remove components. Front glass is not fused to the LCD. Heat gun is needed to replace the LCD.</td>
</tr>
<tr>
<td>Device</td>
<td>Observations</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Google Nexus 7</td>
<td>Device is easy to open. No proprietary fasteners. Battery is easy to replace. LCD does not separate from front glass.</td>
<td></td>
</tr>
<tr>
<td>Apple iPad 1</td>
<td>Front panel is held in place with clips. LCD is not fused to the display glass. Battery is difficult to remove and replace.</td>
<td></td>
</tr>
<tr>
<td>Barnes &amp; Noble Nook Tablet</td>
<td>LCD is not fused to front panel assembly. Excessive adhesive and adhesive strips. Battery replacement requires removing motherboard.</td>
<td></td>
</tr>
<tr>
<td>Google Nexus 10</td>
<td>Easily removable battery. LCD is not fused to glass. The opening procedure is a very difficult process. Several components are attached by both screws and glue.</td>
<td></td>
</tr>
<tr>
<td>Amazon Kindle Fire HD 8.9&quot;</td>
<td>With just a few clips, the device is very easy to open. Heat gun is needed for fused LCD and front glass. Battery and cables are adhered to case.</td>
<td></td>
</tr>
<tr>
<td>Microsoft Surface RT</td>
<td>Once the device is opened, the battery is easily replaced. Difficult to open device. LCD is fused to the front glass.</td>
<td></td>
</tr>
<tr>
<td>Apple iPad 2</td>
<td>LCD is easy to replace once the front panel is removed. Battery is difficult to remove and replace. High chance of cracking the glass during disassembly.</td>
<td></td>
</tr>
<tr>
<td>Apple iPad 3</td>
<td>LCD is easy to remove once the front panel is removed. Excessive amounts of adhesive holds everything in place. High chance of cracking the glass during disassembly.</td>
<td></td>
</tr>
<tr>
<td>Apple iPad 4</td>
<td>LCD is easy to remove once the front panel is removed. Excessive amounts of adhesive holds everything in place. High chance of cracking the glass during disassembly.</td>
<td></td>
</tr>
<tr>
<td>Apple iPad Mini</td>
<td>LCD and glass are not fused together. Excessive amounts of adhesive makes any repair difficult. Hidden screws complicate disassembly.</td>
<td></td>
</tr>
<tr>
<td>Microsoft Surface Pro</td>
<td>Battery is not soldered to the motherboard. Torx of adhesive holds everything in place. Opening the device risks damaging the display cables.</td>
<td></td>
</tr>
</tbody>
</table>
Recycling doesn’t recover sufficient material.

Repair is a cornerstone of future environmental design.
EPEAT is not encouraging reusable designs
Repairability Score: 1 out of 10
It’s Time for a Repair Jobs Revolution

Repair jobs may be an answer to the global unemployment problem, help bridge the digital divide, and cut down the amount of unnecessary waste.
Need

• Integrate reuse and design for repair into future standards
• Make consumables (batteries) user replaceable
• Empower consumers—make it easy for to repair their own products
• Discourage adhesives and difficult to recycle design components
• Make service manuals and recycling information available in a standard format, under open licensing, to everyone that needs it
• Bridge the digital divide by facilitating independent repair shops around the world
iPhone 4代手机拆机图解

iPhone 4 Mobile Phone Teradown Diagram Data

iPhone 4已经陆续送达顾客的手中，ifixit当然也不会落下。顺利的拿到了一台，与一般人不同的是，他们拿到iPhone 4的第一件事就是将它拆解，第一时间让我们看到iPhone 4的零部件究竟有哪些。不可否认，这比光看外型过瘾多了。

Step 1
在拆解之前，我们还是先介绍一下iPhone 4的基本配置和功能。

玻璃和不锈钢机身，宽度和厚度分别比iPhone 3GS减少3.5mm和3mm；
除了经典的黑色，还有白色款可选；
采用Retina显示屏，像素密度是iPhone 3GS的两倍；
内装iOS 4系统，支持多任务；
配备两个摄像头，一个是500万像素的后置摄像头，另一个是VGA前置摄像头。

Step 2
和塑料材质的iPhone完全不同。
四周的不锈钢边框不仅起到固定的作用，还有一个重要的功能：
iPhone天线。

Step 3
正如iPhone 3G和3GS，在iPhone 4底部有两枚银色的Philips #00螺丝。

但是一般这两枚螺丝将会拆掉背部外壳，而不是前面的玻璃。

这样的设计使装回背部外壳时很繁琐，但也意味着装回前面的玻璃比较有挑战。

Step 4
幸运的是，电池很容易就拆得出来。

这是一块3.7V 1420 mAh 的锂电池，可提供7小时的3G网络通话时长以及14小时2G网络通话时长。

但是iPhone 4的电池连接头与3G和3GS的不同。还好，电池没有被焊接到主板。

Step 5
原来是我们拆除连接头时扭开了四枚螺丝刀，EMI屏蔽罩已经随着那四枚螺丝刀拆走了。

Step 6

Step 7

Step 8

更多关于iPhone 4的信息，请参阅ifixit的官方网站。
FIGURE 11A
Mobile phones: Reuse and remanufacturing as a viable alternative to recycling

End-of-life product flows based on 2010 EU figures
Percentage of total end-of-life devices

Status quo
- Mining
  - Parts manufacturer
  - Product manufacturer
  - Service provider
  - User
  - Unaccounted and landfill

Transition scenario
- Mining
  - Parts manufacturer
  - Product manufacturer
  - Service provider
  - User
  - Unaccounted and landfill

Remanufacture
- 1 Remanufacturing, here refers to the reuse of certain components and the recycling of residual materials

SOURCE: Gartner; EPA; Eurostat; UNEP; Ellen MacArthur Foundation circular economy team
FIGURE 11B
Mobile phones: Design changes and investments in reverse infrastructure could greatly improve the circular business case

USD per device

**Reuse**
- Status quo: 22.8
- Improvement: 6.2
- Transition scenario: 6.9

**Remanufacture**
- Status quo: 5.0
- Improvement: 2.6
- Transition scenario: 2.5

**Recycle materials**
- Status quo: 3.1
- Improvement: 0.1
- Transition scenario: 1.3

1 Transition scenario: Conservative assumptions on improvements in circular design and the reverse cycle, within today's technical boundaries

SOURCE: Geyer & Doctori Blass (2008); Neto & Bloemhof-Ruwaard (2009); Neira et al. (2006); EPA; Umicore; LME; Metal Bulletin; recellular.com; amazon.com; recyclermobilephones.co.uk; Ellen MacArthur Foundation circular economy team
It’s time to fix our economy.

Let’s train up an army of mechanics and technicians and make repair local again.
WHY REPAIR?

Repair saves you money. It saves the environment. And it connects us to our things. Ditch the throwaway economy. Join the repair revolution.

Repair is Freedom

Repair creates Jobs

Repair is Sustainable
Why now?

Repairing electronics requires more knowledge about the product design than ever before.

- Products are designed in the US and Europe.
- They're manufactured by legions of workers in Asia.
- Repair shops in Asia thrive on the information shared by those manufacturers.
- Repair workers in the US and Europe are struggling because they don't have the information they need.
Right to Repair is a Growing Movement

88% of Voters

in Massachusetts overrode the car companies and passed the automobile owners’ Right to Repair law in November, 2012.

114,322 Americans

signed a petition to legalize cell phone unlocking. The White House supports cell phone unlocking—but your voice is still needed to convince Congress.
## Independent Repair Creates Millions of Jobs

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>General maintenance and repair workers</td>
<td>1,289,000</td>
</tr>
<tr>
<td>Automotive service technicians and mechanics</td>
<td>723,400</td>
</tr>
<tr>
<td>Heating, air conditioning, and refrigeration mechanics and installers</td>
<td>267,800</td>
</tr>
<tr>
<td>Diesel service technicians and mechanics</td>
<td>242,200</td>
</tr>
<tr>
<td>Telecommunications equipment installers and repairers</td>
<td>194,900</td>
</tr>
<tr>
<td>Heavy vehicle and mobile equipment service technicians</td>
<td>179,200</td>
</tr>
<tr>
<td>Automotive body and glass repairers</td>
<td>170,900</td>
</tr>
<tr>
<td>Aircraft and avionics equipment mechanics and technicians</td>
<td>142,300</td>
</tr>
<tr>
<td>Electrical and electronics installers and repairers</td>
<td>141,100</td>
</tr>
<tr>
<td>Small engine mechanics</td>
<td>68,800</td>
</tr>
<tr>
<td>Home appliance repairers</td>
<td>47,700</td>
</tr>
<tr>
<td>Home entertainment equipment installers and repairers</td>
<td>36,800</td>
</tr>
<tr>
<td><strong>Total Jobs</strong></td>
<td><strong>3,504,100</strong></td>
</tr>
</tbody>
</table>

For every 1000 tons of electronics ... *

Landfilling creates > 1 job

Recycling creates 15 jobs

Repairing creates 200 jobs

* According to the Illinois Department of Commerce and Economic Activity
5 million tons of out-of-use electronics are piling up in America.

23% of shredded electronics could be easily repaired or refurbished.

250,000 jobs would be created by repairing 23% of our out-of-use electronics.
Challenge

• Integrate reuse and design for repair into future standards
• Make consumables user replaceable
• Empower consumers by making it easy to repair their products
• Discourage adhesives and difficult to recycle design components
• Make service manuals and recycling information available in a standard format, under open licensing, to everyone that needs it
• Bridge the digital divide by facilitating independent repair shops around the world
oManual is a simple, open XML-based standard for semantic, multimedia-rich procedural manuals.

Traditional procedural documents like service manuals don’t meet the needs of modern applications. Documents need to incorporate multimedia and understand prerequisite dependencies. The oManual file format enables interoperability while allowing complete flexibility of presentation.