Repair and Software: Updates, Obsolescence, and Mobile Culture's Operating Systems

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What is the status of objects in the digital age? How do you archive and maintain something like a mobile app? I posed these questions to 100 archivists, curators, conservators, and unit heads at the Smithsonian Museum in early-2016. Scholars and practitioners who work in the field of repair and maintenance know that the digital world is deeply linked to a wide range of physical objects such as devices, servers, fiber optic cables at the bottom of the sea floor, HVAC units, electrical grids, cell towers, antennas, among others. But the status of objects has perhaps fundamentally changed, leaving profound ramifications for those working on repair and maintenance. One primary area of change is the location where content is stored. For some of the objects in the Smithsonian's collection, content is linked with the thing itself; that is, the message is written onto the object and inseparable from it. For digital media, though, the content is often separated from the device, housed on an external server that communicates with a mobile phone (for example) but otherwise has no physical link to the object. Once the server goes down, the content disappears, regardless of how well we maintain the device itself.

Much scholarly and practical work on repair and maintenance, as Peter Sandborn notes, centers on the hardware life cycle; however, in most complex systems, "software life cycle costs (re-design, re-hosting and re-qualification) contribute as much or more to the total life cycle costs as the hardware, and the hardware and software must be concurrently sustained."[1] *This became immediately apparent to me as I gathered around a workbench with my undergraduate students to fix the screen and replace the battery on an iPhone 3G from 2008. We finally got the phone to turn on, which was the first time the phone had powered on in four years. It had been sitting at the bottom of my desk drawer since 2011. We launched a few apps and found that nearly all of them required an update and, in order to access newer features, we were required to upgrade to a more recent operating system. Similarly, any attempt to download a new app failed with a warning such as "This app requires iOS 7.0" (see Figure 1).*

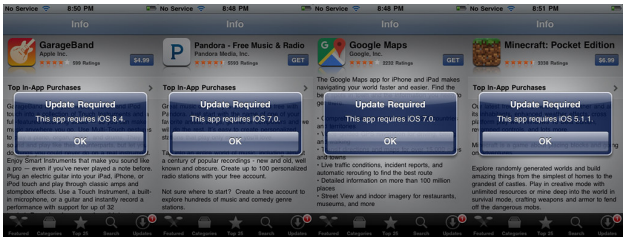

Figure 1: Attempts to download new apps onto an iPhone 3G. The phone is running the 3.1.3 operating system from 2009. Image courtesy of Jason Farman.

I plugged the phone into my laptop and connected it with iTunes to back it up and update the iOS. This final step proved to be my undoing: as I attempted to update the operating system to iOS 9, I realized that my old iPhone 3G is not even "allowed" to update to the latest iOS since it is such an "old" device. Looking at a compatibility chart released by Apple is revealing (see Figure 2). Since 2007 with the launch of the first iPhone, there have been nine major releases of the iPhone operating system and dozens of versions of those releases. With each new operating system, apps update to reflect the affordances of that system and rarely preserve backward compatible versions for older iOSs.

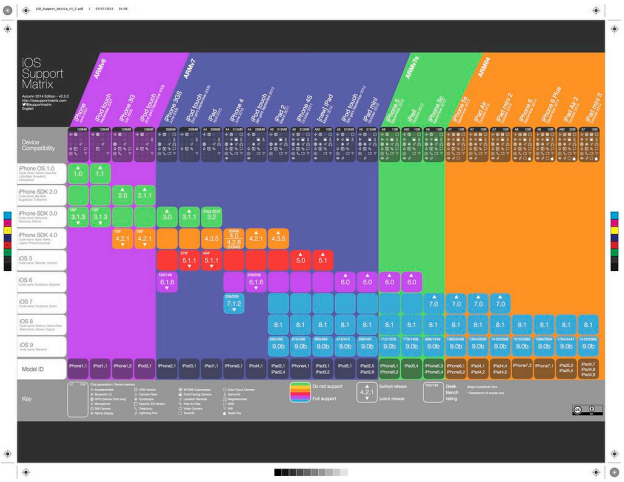

Figure 2: Operating systems supported by iPhones and iPods, 2007-2014. Image courtesy of Apple under Creative Commons License.

The most recent iOS that this iPhone 3G can run is the 4.2.1 operating system from 2010. I keep the existing operating system on the phone, but this allows very little functionality: Internet browsing, phone calls, and snapping pictures with its 2 megapixel camera (no videos can be recorded on this phone). I can play music with this old version of iTunes, and the version of Spotify that I'm running is still able to access my account. But other current music apps cannot be downloaded to this operating system.

This iPhone is nine years old; when considered in the larger scale of technological change, this is an incredibly short timespan for the technology to become obsolete. Yet, its obsolescence points to one of the major challenges repair cultures will face in the coming years. While the technologies themselves can be repaired (i.e., screens and batteries replaced, headphone jacks or home buttons repaired), the software running these devices—especially as they connect to databases that store the content of the apps being run on the phone—are creating technologies that cannot be used according to the original design of the device. These devices thus become shadows of their original selves or become repurposed for alternative uses. Many use repurposing (both in artistic ways and as reimagined technologies) to highlight the tension with planned obsolescence in the digital age.[2]

The "update" is often positioned as a positive for consumers of digital technologies and typically represents an advancement in product capability and features. Since an object like a mobile phone is intimately coupled with its software, it's no coincidence that each launch of a new Apple iPhone has also accompanied a release of a new operating system. This approach has been Apple's signature means of generating consumer interest and sales. Software obsolescence for these phones is reflected in the outward changes to their physical shape, following in part a logic introduced by annual models changes in the automobile industry. As initiated by General Motors starting in the 1920s to compete with Ford's Model-T, the transformation of physical features of a technology to signify "newness" has become a standard practice in generating consumer interest and buying power. As GM was faced with the inability to improve its technology as a mode of competition with Ford, they turned to transforming the superficial features of car's physical body. As Giles Slade notes, "the car's lines were made low and round, in imitation of the luxury cars of the day, and its hood was elongated to suggest that it contained a powerful engine. Next to this redesigned version of the 1923 Chevrolet, the Model T looked like a piece of farm machinery. Car customers quickly noticed the difference and responded favorably."[3] GM quite literally capitalized on "psychological obsolescence" since creating the illusion of newness was a more powerful and less expensive means of generating

consumer interest than those achieved by "technological obsolescence."

The iPhone, and Apple products in general, have followed suit by introducing a new version of their phones and their operating systems each year since 2007. While there have been notable shifts in the technological affordances of these devices, the obsolescence introduced simply by changing the outward physical look of the device has proved a powerful technique to stimulate purchasing (see Figure 3 and Figure 4).

Figure 3: All iPhones from 2007 through 2015. Across these 12 different versions, the physical shape of the devices has functioned to signify "newness" to customers.

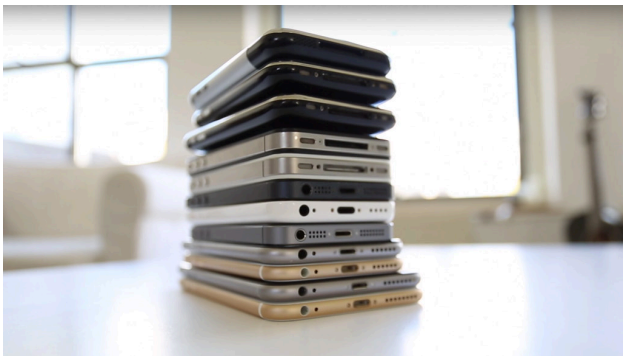

Figure 4: All iPhones from 2007 through 2015 stacked to show the shifts in design. Across these 12 different versions, the physical shape of the devices has functioned to signify "newness" to customers.

Beyond making the phone look different, the newer operating systems make older phones run at a sluggish pace. These new operating systems are not designed with the old models in mind. While Apple could design an iOS that would function well for both the iPhone 3G and the iPhone 6SPlus, there is very little incentive to do so. Instead, the company benefits from the need for consumers to purchase a new device and discard an old one (which we do at a pace of 426,000 discarded mobile devices *a day* in the United States).[4]

Repair groups, fixer movements, and maintenance advocates continually contend with the limited life designed into the technologies we use. Repair and maintenance, it could be argued, doesn't simply emerge out of a need to counter the planned obsolescence built into our technologies; instead, as advocated by Steven Jackson's notion of "broken world thinking," repair is a practice that emerges alongside the broken world and opens up new ways of seeing the challenges we face. As Jackson writes,

The question is this: can repair sites and repair actors claim special insight or knowledge, by virtue of their positioning vis-à-vis the worlds of technology they engage? Can breakdown, maintenance, and repair confer special epistemic advantage in our thinking about technology? Can the fixer know and see different things—indeed, different worlds—than the better-known figures of "designer" or "user"?[5]

One such technological insight brought about by working on maintaining mobile phones is the growing rate of "app obsolescence" for these devices. As the corporations that design and maintain these apps go out of business, massive areas of mobile life are no longer accessible and are, to date, not archived in a way that mirrors the functionality Internet Archive for websites. This recently became pronounced to me as I was giving a guest lecture on my book *Mobile Interface Theory. Published in early-2012, I noticed that nearly every app I discussed in the book was now obsolete and missing from the app stores.*

One of these obsolete apps was an oral storytelling app called Broadcastr. Having written about this app in academic and popular press articles, I was optimistic about the potential for this app to create a space for multiple stories to be told about a single spot.[6] *But for various reasons, the company shifted its focus to other possible markets in the mobile app business. Abandoning Broadcastr, the app disappeared from the app store and all of the oral stories that were created for the app vanished (see Figure 5).*

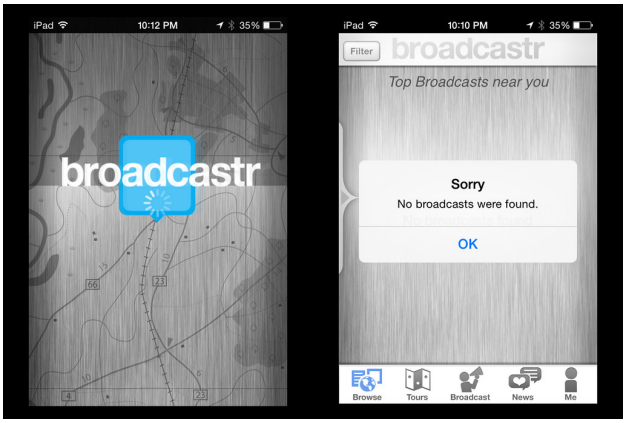

Figure 5: Screenshots of the Broadcastr app, which went defunct in 2012. Images courtesy of Jason Farman.

The reason that apps like Broadcastr can no longer be experienced is because all of their data was stored on databases like Amazon's Web Services (AWS) cloud; once the mobile app company goes under or shifts directions, all of that data disappears and the app is a shell without content.[7] *Before disappearing from users' phones, Broadcastr offered a window of time for contributors to download their oral stories from the app. Once that window closed, all of the stories were deleted from Broadcastr's database and could no longer be accessed. In a recent conversation with one of the app's co-founders, I was told that not even those who founded the company have access to an archive of the oral narratives recorded for the app.*

Beyond the larger consequences of this archival black hole[8]—one caused by the link between apps (as software) and databases—app obsolescence has large repercussions for the field of repair. As older smartphones and tablets are repaired, there are very few avenues that allow users to experience the devices as they were used during their time. While there is a dire need for large-scale archival work to be done for the app ecosystem as a form of technological maintenance, grassroots organizations are beginning to work on hacking old operating systems to allow old phones to run contemporary programs[9] and other organizations are working to curate lists of apps that still function on early operating systems.[10] *Alongside repair collectives, organizations working to address the culture of app obsolescence will play an important role in the future of repair culture.*

"The update" to software is a compelling figure for understanding the future challenges faced by the field of repair and maintenance. The update also becomes a foundational motif for digital media, one that has come to define the very nature of these objects. As Wendy Chun argues, "New media live and die by the update: the end of the update, the end of the object. Things no longer updated are things no longer used, usable, or cared for, even though updates often 'save' things by literally destroying—that is, writing over—the things they resuscitate."[11] Here, there is a materialist shift in defining the object of repair: it is not simply the physical object that needs repair or maintenance, but the physical object *in its relationship with the perpetual software update*. In the digital age, while the object is often conflated with the content it conveys, we are discovering that those two elements do not coincide as the digital object falls under the auspices of planned obsolescence. While the figure of the update in many ways mirrors the challenges faced by other areas of repair and maintenance (e.g., the Smithsonian having old computers and audio players on hand to access archival media stored on older formats), there does not seem to be a parallel for mobile app software. Here, there is no ability to archive an older machine to access older content since the content exists on a separate machine altogether such as a cloud server. This is ultimately divorced from the familiar scene of the repair collective bringing in older technologies to be fixed. Instead, we face distinct and growing repair challenges in the age of mobile software, as objects no longer cohere at the physical level, but are instead spread out among devices, databases, and app downloads such that objects become void of the content they seek to hold.

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[9] See Whited00r: http://www.whited00r.com/about.

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