

Why we need to tackle the growing mountain of 'digital waste'

May 10 2016, by Chris Preist



Video streaming services such as iPlayer need 'green' software, too. Credit: dantaylor, CC BY

We are very aware of waste in our lives today, from the culture of recycling to the email signatures that urge us not to print them off. But as more and more aspects of life become reliant on digital technology, have we stopped to consider the new potential avenues of waste that are being generated? It's not just about the energy and resources used by our devices – the services we run over the cloud can generate "digital waste" of their own.

Current approaches to reducing energy use focus on improving the hardware: better datacentre energy management, improved electronics that provide more [processing power](#) for less energy, and [compression techniques](#) that mean images, videos and other files use less bandwidth as they are transmitted across networks. [Our research](#), rather than focusing on making individual system components more efficient, seeks to understand the impact of any particular digital service – one delivered via a website or through the internet – and re-designing the software involved to make better, more efficient use of the technology that supports it.

We also examine what aspects of a digital service actually provide value to the end user, as establishing where resources and effort are wasted – digital waste – reveals what can be cut out. For example, MP3 audio compression works by removing frequencies that are inaudible or less audible to the [human ear](#) – shrinking the size of the file for minimal loss of audible quality.

This is no small task. Estimates have put the technology sector's global carbon footprint at [roughly 2% of worldwide emissions](#) – almost as much as that generated by aviation. But there is a big difference: IT is a more pervasive, and in some ways more democratic, technology. Perhaps [6% or so of the world's population will fly](#) in a given year, while [around 40% have access to the internet at home](#). More than a [billion people have Facebook accounts](#). Digital technology and the online services it

provides are used by far more of us, and far more often.



Credit: AI-generated image ([disclaimer](#))

It's true that the IT industry has made significant efficiency gains over the years, far beyond those achieved by most other sectors: for the same amount of energy, computers can carry out [about 100 times as much work as ten years ago](#). But devices are cheaper, more powerful and more convenient than ever and they're used by more of us, more of the time, for more services that are richer in content such as video streaming. And this means that overall energy consumption has risen, not fallen.

Some companies design their products and services with the environment in mind, whether that's soap powder or a smartphone. This [design for environment](#) approach often incorporates a [life-cycle](#)

[assessment](#), which adds up the overall impact of a product – from resource extraction, to manufacture, use and final disposal – to get a complete picture of its environmental footprint. However, this approach is rare among businesses providing online digital services, although some make significant efforts to reduce the direct impact of their operations – Google's [datacentres harness renewable energy](#), for example.

We were asked to understand the full life-cycle cost of a digital operation by Guardian News and Media, who wanted to include this in their annual sustainability report. We examined the impact of the computers in the datacentres, the networking equipment and transmission network, the mobile phone system, and the manufacture and running costs of the smartphones, laptops and other devices through which users receive the services the company provides.

In each case, we had to determine, through a combination of monitoring and calculation, what share of overall activity in each component should be allocated to the firm. As a result of this, Guardian News and Media became the first organisation to report the end-to-end carbon footprint of its digital services in its [sustainability report](#).

But what design approaches can be used to reduce the impact of the digital services we use? It will vary. For a web search service such as Google, for example, most of the energy will be used in the datacentre, with only a small amount transmitted through the network. So the approach to design should focus on making the application's software algorithms running in the datacentre as efficient as possible, while designing the user interaction so that it is simple and quick and avoids wasting time (and therefore energy) on smartphones or laptops.

On the other hand, a video streaming service such as BBC iPlayer or YouTube requires less work in the datacentre but uses the network and end-user's device far more intensively. The environmental design

approach here should involve a different strategy: make it easier for users to preview videos so they can avoid downloading content they don't want; seek to avoid digital waste that stems from sending resource-intensive video when the user is only interested in the audio, and experiment with "nudge" approaches that provide lower resolution audio/video as the default.

With the explosive growth of digital services and the infrastructure needed to support them it's essential that we take their environmental impact seriously and strive to reduce it wherever possible. This means designing the software foundations of the digital services we use with the environment in mind.

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