

# The Digital Commons: Tragedy or Opportunity? A Reflection on the 50<sup>th</sup> Anniversary of Hardin's Tragedy of the Commons

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**The Digital Commons: Tragedy or Opportunity?**  
**A Reflection on the 50<sup>th</sup> Anniversary of Hardin's Tragedy of the Commons**

**Frank Nagle<sup>1</sup>**

**Abstract**

On the 50<sup>th</sup> anniversary of Garrett Hardin's "The Tragedy of the Commons", this article considers the benefits and potential downsides of the digital commons, which emerged well after Hardin wrote his seminal article. Unlike the physical world Hardin wrote about, the digital world is essentially infinitely abundant, which leads to a very different tragedy, and many new opportunities

Fifty years ago, Garrett Hardin published his seminal *Science* article "The Tragedy of the Commons" (Hardin, 1968)<sup>2</sup> Although Hardin's core argument was focused on overpopulation, the most lasting image from the article is of farmers increasing the number of cows they let graze on the town commons, which leads to overuse of the commons, and the eventual depletion of this shared resource. This problem was of such importance that in 2009, Elinor Ostrom won the Nobel Prize for her deep exploration of methods and policies to govern the commons (Ostrom, 1990). However, until recently, the study of the commons has been primarily focused on the physical world where common goods like grass are both finite and rivalrous (if my cow eats a particular blade of grass, then your cow cannot eat it). Policy efforts related to the commons have reflected this focus on the physical world. Comparatively, in the digital world public goods are non-rival and essentially infinitely abundant. However, the nearly infinite supply of a public digital good

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<sup>2</sup>As Hardin himself noted, his work built upon and formalized concepts and concerns introduced more than a century before that by William Forster Lloyd (1883).

can still be tragic, albeit in a different manner, and has implications for scientific inquiry and policy development. At the same time the digital commons can offer a treasure trove of opportunities for societal progress and scientific discovery. This article explores the various pros and cons of the digital commons and calls for further research to better understand the long-term impact of this transformational phenomenon and how government policies can help support the benefits while mitigating the costs.

### **The Tragedy of the Digital Commons**

A classic example of the tragedy of the digital commons is the case of the encyclopedia. Encyclopedia Britannica (which coincidentally was first published exactly 250 years ago) had \$650 million in revenue in 1990, but was sold six years later for \$135 million, and its value has continued to decline. This destruction of value was due to the digitization of encyclopedias, first Microsoft's Encarta, later followed by Wikipedia, the crowdsourced digital encyclopedia that is free (Greenstein, 2017). In just over a decade, the revenues of the entire encyclopedia industry all but disappeared in an apparently massive destruction of value due to digitization in general, and the digital commons in particular. At first glance, this may appear to be simply a modern-day example of creative destruction (Schumpeter, 1942), the fact that a revenue-generating enterprise was replaced by a digital commons means that Gross Domestic Product (GDP) and other monetary measures of societal value have fallen, but the non-pecuniary nature of most of the crowdsourced digital goods entering the market makes the destructive impact of these innovations more apparent than the creative one.. This has occurred in many settings, essentially creating a transparent economy full of digital dark matter (Greenstein and

Nagle, 2014) and technology related intangible assets (Saunders and Brynjolfsson, 2016). These changes in economics have implications for organizational structure and challenge our existing notions of what a firm is. Traditionally, the boundaries of the firm were well defined and most activities occurred within one organization since transaction-costs for coordinating across organizations were prohibitively expensive (Coase, 1937; Williamson, 1975). However, the growing presence of the digital commons is leading firms to increasingly innovate and produce outside the boundaries of the firm by partnering with external communities and lead users (Altman et al, 2015; Baldwin and von Hippel, 2011; Davis, 2016; Lakhani et al, 2013; West et al, 2014).

This potential tragedy of the digital commons goes beyond the science of economics and management and also impacts our understanding of law, medicine, sociology, and communications. In law, the digital commons and the Internet, have led to a flattening of the world where traditional legal structures are not flexible enough to deal with increasingly complex legal situations (Hadfield, 2016). In particular, traditional intellectual property protection methods such as patents, copyrights, and non-competes are less relevant in the world of the digital commons (Benkler, 2017). Such concerns exacerbate the existing issues of governing the knowledge commons (Frischmann et al, 2014) which are increasingly available via digital means. Even legalities related to the medical field are increasingly complicated by the digital commons (Strandburg et al, 2017). Such legal difficulties can impact the study of scientific fields as disparate as genomics, earth science, and astronomy due to legal issues with opening data via the digital commons across national borders (Contreras and Reichman, 2015).

In sociology, the ways in which groups interact are being influenced by the digital commons. A recent study showed that most teenagers would prefer to interact with their friends via digital platforms rather than in person.<sup>3</sup> More broadly, the digital commons create spaces for individuals to interact, but they do so in ways that are quite different than in the real world (Mansell, 2013) which leads to traditional methods of studying sociology being less effective (Lupton, 2014). This is particularly the case when thinking about the collective memory of society as digital commons like Wikipedia can change how individuals and society create, store, and recall information (Garcia-Gavilanes et al., 2017). In the field of communications, contrary to the traditional notion of a town square, digital platforms such as Facebook, Twitter, and Instagram have led to central actors having a great deal of control over how people interact. The power of these platforms to give a public megaphone to hate speech or false news (Mondal, et al, 2017; Vosoughi, et al., 2018), sway public opinion (Sunstein, 2017) and limit the speech of individuals (Gillespie, 2018) has become readily apparent in the last few years. Further, the increasing availability of personal information via the digital commons and these platforms have led to a reduction in the expectation of privacy, to the point where Mark Zuckerberg, the CEO of Facebook, felt comfortable saying “privacy is no longer a social norm” (Johnson, 2010).

### **The Opportunity of the Digital Commons**

Despite this apparent destruction of value and disruptions to scientific inquiry, the reduction in prices for many digital goods to zero, or almost zero, also represents a great opportunity for science (Teodoridis, 2018). For example, while the encyclopedia industry

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<sup>3</sup> <https://www.commonsemmedia.org/social-media-social-life-infographic>

may no longer be adding a significant amount to GDP directly, Wikipedia and other online knowledge repositories are certainly still allowing for the accumulated wisdom of prior generations to be passed on and used in a productive manner (Thompson and Hanley, 2018). The digital commons also increase opportunities associated with a variety of fields including education, healthcare, manufacturing, innovation, intellectual property, public discussion, government, finance, and science itself. Each of these are discussed briefly below, but warrant a great deal of further research.

In education, the digital commons have enabled the rise of massive open online courses (MOOCs), which are transforming the ability of underserved communities to access high quality educational courses (Schmid et al, 2015). In healthcare, not only have traditional medical institutions, like the Mayo Clinic, digitized much of their medical knowledge and made it publicly available<sup>4</sup>, but digital commons such as Patients Like Me<sup>5</sup> allow individuals with rare diseases to find others with similar diseases and explore treatment options while also creating a dataset for the further development of treatments for these long-tail conditions (Wicks et al, 2010; Torrance and Von Hippel, 2015). More broadly, the ability to conduct science in general has been positively impacted by the advent of the digital commons. Starting when the Invisible College (later The Royal Society) published the first peer-reviewed scientific journal, *Philosophical Transactions*, in 1665, science has advanced and diffused via the wide distribution of scientific studies (The Royal Society, n.d.). Today, not only do most scientific journals have an online presence, but the digital

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<sup>4</sup> <https://www.mayoclinic.org/diseases-conditions/>

<sup>5</sup> <https://www.patientslikeme.com/>

commons has enabled open access pre-print websites like arXiv and SSRN.<sup>6</sup> Further, citizen science (also known as crowd science), allows individuals with limited scientific training to participate in wide-ranging projects from the health of coral reefs, to protein folding and the search for extra-terrestrial life.<sup>7</sup>

In manufacturing, the advent of 3D printing technologies has led to the creation of digital commons, such as Thingiverse<sup>8</sup>, that host millions of blueprints for 3D models that can be downloaded for free and used to make physical products. Although many of these products are small and simple plastic devices, it is now possible to 3D print everything from a car, to a house, to a pizza, to even a human ear. Such opportunities may have dramatic effects on both the manufacturing industry and the shipping industry, as it has been pointed out that “It is easier to ship recipes than cakes and biscuits.”<sup>9</sup> Beyond production, digital commons also allow for an increased opportunity for users to be directly involved in the innovation process as lead users (Von Hippel, 1986) or via peer production (Benkler and Nissenbaum, 2006). Examples of this include open source software and hardware (Pearce, 2012; Nagle, 2018), crowdsourced design competitions (Boudreau et al, 2011; Lifshitz-Assaf, 2017), open source cars (High, 2017), and even open source space ships (Aaronson, 2012). The digital commons also have an impact on intellectual property as it is increasingly possible for individuals and organizations to release works of art and science under licenses like the Creative Commons<sup>10</sup> which allows others the right to use and build upon a given work (Elkin-Koren, 2005).

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<sup>6</sup> <https://arxiv.org/> and <https://ssrn.com/>

<sup>7</sup> <https://www.inaturalist.org/>, <https://fold.it/>, and <https://setiathome.berkeley.edu/>

<sup>8</sup> <https://www.thingiverse.com/>

<sup>9</sup> This quote is frequently attributed to the economist John Maynard Keynes, but the evidence it originated with him is limited.

<sup>10</sup> <https://creativecommons.org/licenses/>

Finally, digital commons are also having a large impact on public discussion, government, and finance. For more than a decade, social media has increasingly served as something akin to a digital town square. Although most social media companies are run as for-profits (and not commons) there are efforts to create versions of social media that are operated as commons.<sup>11</sup> Going one step further, digital commons have provided a mechanism for crowdsourced democracy. Candidates from the Net Party in Argentina (Scaturro, 2014) vow to make every legislative vote in accordance with the stated preferences of their constituents which are gathered using an open source application called DemocracyOS<sup>12</sup>, allowing for a truly direct democracy. Innovations in financial technology, such as the blockchain decentralized ledger, have allowed for the rise of digital currencies, like Bitcoin, which are not backed by any government, but are instead governed under a digital commons model. Although the legalities of such currencies are still in question, they have already had an outsized impact on global financial markets (Farrell, 2013).

### **A Call for Research and Policy Implications**

The goal of this article is to shine light on an important phenomenon and to call for further research to help bring order out of the chaos of the digital world. Better understanding various aspects of the transformative effects of the digital commons may also contribute to a growing literature on the future of work, firms, governments, and the increasingly blurred line between physical and information goods. In particular, as the digital commons leads to more firms structured as platforms whose business models result in the gamification or

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<sup>11</sup> E.g., <https://elgg.org/>.

<sup>12</sup> <http://democracyos.org/>

leisurification of work, people are increasingly doing work without getting paid for it (or at least getting massively underpaid). A deeper understanding of this phenomenon may help to explain puzzles related to wage inequality and the wealth gap, which could inform regulatory policies to help better address these concerns. Relatedly, as value creation, innovation, and production increasingly move outside the boundaries of the firm, the role of firms in society may begin to change. Given that firms have provided the social safety net (healthcare, retirement, etc.) in the United States for the last century, policies will need to address the increasing number of people that are not directly employed by a firm and therefore have no firm provided safety net. Similar questions could arise as to the functions of government and financial systems in the face of the opportunities the digital commons presents for true democratization of traditional institutions. However, such a society would still need policies to protect individual citizens from being exploited.

Finally, the advent of 3D printing, combined with the digital commons, sees us entering an era where physical goods become information goods, such that the form and function of a product are now separate (Yoo, 2013). As mentioned above, this process of informationization of physical goods is occurring in everything from houses to food to human body parts. Therefore, the lessons learned about the impact of the digital commons, and other digital goods with a marginal cost of zero, may very well apply to all information goods, and many physical goods, in the near future. Policies must be implemented to help with the transition period so that individuals and companies who see their entire industry disrupted via the digital commons can survive and thrive in the new world. For example, Encyclopaedia Britannica had 2,300 employees in 1991, but only had 160 employees in 2017. Meanwhile, Wikipedia's parent organization only has roughly 300 paid employees,

while the vast majority of contributors go unpaid. That implies that not only did thousands of people lose their jobs, but they needed to enter a different industry to get a new job. We do not currently understand how this phenomenon will play out in the physical world (e.g. manufacturing), which makes policy creation difficult. Existing research in this area has only scratched the surface and must dig deeper as we enter a brave new world where physical goods (like the grass of the town commons in Hardin's article) that have been finite for all of human history, may someday be infinitely abundant, upending the assumptions upon which economics, and many other sciences, are based.

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