Selling Bytes:
A survey of issues in digital and virtual goods

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Abstract

Digital and virtual goods are both information goods that arose from the popularization of personal computing and the recent growth of digital information networks. These two types of goods are related – both intangible and consist of bytes stored in digital media. As a result, the terms are often used synonymously. However, there are significant differences between these two types of information goods, in terms of properties, functions, and methods of production. They also face related but distinct problems in the creation of markets for their sale and exchange, and policy issues over the regulatory structures for these markets. This paper is a brief examination of the fundamental similarities and differences between digital and virtual goods, the economic rationales for their production, and some issues involved in the creation and maintenance of markets for these goods.

1 Introduction

With the diffusion of networked information systems – such as the Internet and the World Wide Web – the recent years have seen a significant growth in both the production and consumption of digital goods. Typically information-intensive goods like books, news, music, film, or even software, these products were once firmly embodied in physical media. Now, they are often produced, sold, and delivered entirely digitally, without ever attaining tangible form. The transition to digital production and consumption of these goods have not been entirely smooth, as record companies, newspapers, and software developers can (and often) attest. Many of the issues surrounding markets for information goods (as listed by Varian [Varian, 1998], especially the issue of piracy) have proven more intractable than anticipated. Nevertheless, markets for digital goods do operate at varying levels of success, with the Apple iTunes Store (a
seller of all of the aforementioned types of digital goods) alone accounting for $1.4 billion in revenue in Q2 2011 [Apple, Inc., 2011].

Even more recently, however, another type of digital information good has also gained traction. Often referred to as virtual goods, these are typically entirely fictional goods existing within some type of online community or virtual world but exchangeable for real-world currency in some way. While they are also entirely digital in production and consumption, unlike typical digital goods, these virtual goods tend to serve no real-world function at all. For example, virtual crop seeds and farm equipment in the popular social network-based game Farmville, only serve functions within the Farmville world, and cannot be used for any farming-related tasks in the actual physical world. Nevertheless, markets for these types of virtual goods are flourishing, with some estimates describing the overall virtual goods market at $7.1 billion in 2010 [Greengard, 2011] and Zygna (operator of Farmville and other virtual-goods driven games) annual revenues estimated at $850 million in 2010 [Ha, 2011].

Many sources, particularly in the popular press, tend to conflate these two types of goods as synonymous. Despite superficial similarities – that they are both purely digital, intangible products – digital goods exhibit some different fundamental properties from virtual goods. Digital goods are a strict subset of what Varian defined as information goods, exhibiting the same high-production-cost, low-variable-cost, non-rivalrousness nature of information goods, and have real-world value. Virtual goods, on the other hand, have value and functionality only within a given virtual world or community context, but are not necessarily non-rivalrous within that context. While digital goods are often media products, and are consumed like media, virtual goods tend to exhibit the same “thing-like” nature of real-world commodities and are often consumed the same way. Markets for both types of goods are based upon the foundation of intellectual property rights, but in subtly different ways. Finally, while digital goods struggle with classic information goods problems, virtual goods face different economic and legal challenges arising from their context-dependent nature. In the following sections of this paper, I explore each of these issues in turn.
2 Defining digital and virtual goods

It is first useful to define what is meant by digital vs virtual goods, given the similarities in their meanings. Given the relative dearth of literature on virtual goods, this is actually a fairly difficult problem.

2.1 Digital goods

Digital goods, having developed in significance alongside the Internet (and made notorious by digital and software piracy concerns), are relatively well-studied and well-defined in the literature. The most common definitions describe digital goods as products stored and distributed in digital form, usually directly over an electronic information network (for example, in [Zhu and MacQuarrie, 2003, Rayna, 2008]). In these definitions, digital goods are Varian’s information goods [Varian, 1998] actualized – the set of information goods (“anything that can be digitized”) that are, in fact, digitized.

As information goods, digital goods exhibit certain general properties. They are, by definition, intangible – ultimately being represented as strings of stored bytes. In pure form, they are considered non-rivalrous goods [Quah, 2003]. Due to the ease and perfection of digital copying, consumption by one does not diminish the original good or preclude another from consuming the same. Such goods also have high fixed cost of production and near-zero variable cost, for once the first one is created, others can be easily reproduced by simply copying the same bytes.

Finally, digital goods are digital representations of real-world products, with some form of intrinsic value. This means that they are simply information goods embodied in a different form than their usual physical ones. The typical examples – such as an MP3 of a song or a digital subscription to a newspaper – reflect all of the aforementioned properties. They are digitized versions of information products, lacking physical form, and difficult to produce but easily copied.
Figure 1: Digital vs virtual goods. In Figure 1(a), the New York Times iPad digital edition is an example of a digital good. In Figure 1(b), the Crystal Palace space station in the MMO game Entropia is an example of a rivalrous virtual good. In Figure 1(c), the goods in the Farmville game market are examples of non-rivalrous virtual goods.

2.2 Virtual goods

However, this broad definition becomes problematic when virtual goods are involved. Virtual goods have been popularized relatively recently by online communities and massively multiplayer online games (MMOG), though its history reaches back to the days of communities built around bulletin-board systems and text-based multiplayer adventures. The concept of virtual assets within an online community – things like houses, furniture, equipment “owned” by individual users – had been part of most multiplayer user dimensions (MUDs), from purely text-based servers by hobbyists in the 1980s to commercial ventures like Ultimate Online in the 1990s. This culminated in the early 2000s with the release of EverQuest, the first virtual world of sufficient scope and trade activity to be studied for micro- and macroeconomic behaviors [Castronova, 2001]. In these instances, in-game items like swords and armor could be made by one player from in-game raw materials and sold for in-game currency. Likewise, some in-game land, castles, and other fixed property could be made available by the developers and sold to players for virtual currency.

Only recently, however, has the trend of virtual items being sold for real-world currency emerged. The latest generation of online communities and games, especially those based on the so-called “freemium” business model, are sometimes centered around the exchange of virtual goods for real-world currency. In the virtual world Second Life,
where users can design, produce, and trade virtual items like clothing, furniture, or tools for in-game currency (the so-called “Linden dollars”, named for the corporate owner Linden Labs). While such in-game currency can be earned by performing certain tasks within the virtual world, it can also be exchanged (in both directions) for real-world currency according to variable exchange rates. Entropia, a large commercial multiplayer game, recently conducted an auction on a “space station”, a virtual property within its game world, for $330,000 USD to one of its players\(^1\). On a more mundane front, Zynga’s flagship social game Farmville – a shared world based on the Facebook social network – is entirely based on selling virtual crop seeds, farm equipment, and vanity decorations for real-world currency.

At first glance, these virtual goods are also products stored and distributed in digital form (and in fact, do not exist in any other form), and therefore fit the general definition of digital goods. They, too, consist of intangible strings of bytes. However, “goods represented and sold as bytes” is perhaps the only property that virtual goods share with digital goods.

Three primary distinctions exist between the two types of goods. The first distinction is that virtual goods can be – and is usually – rivalrous, within the context and the rules of the its virtual world [Fairfield, 2005]. In the aforementioned example, the Crystal Palace space station is a rivalrous good within the Entropia game world, and once sold, cannot be owned by another. The second distinction is that unlike typical digital goods, virtual goods must have a persistent, shared context to have economic value – whether that be a shared online world operating under a single set of rules, or a joint understanding among all buyers and sellers of the virtual items. For example, Second Life items and currency have no function outside the context of Second Life, and Farmville purchases do not enable the operation of a real-world farm. These items have value only because of the shared virtual worlds they are within – users who participate in these worlds implicitly accept such value. Should the worlds themselves be shutdown, that value simply ceases to exist, and therefore strong persistence

\(^1\)See http://www.joystiq.com/2010/01/02/man-buys-virtual-space-station-for-330k-real-dollars/
is important in maintaining the value of such goods – there must be some guarantee that the good will be there in the future. Likewise, the third distinction is that virtual goods need not be digitized representations of real-world items – while digital goods are digitized reflections of real-world information goods, virtual goods – like the Entropia space station – may represent something that does not have a real-world counterpart.

Of note, Lehdonvirta observes that Internet domain names are interesting early examples of a virtual good [Lehdonvirta, 2009]. Domain names are human-readable names of convenience mapped to (far more difficult to remember) Internet Protocol addresses, and part of the basic networking infrastructure upon which the Internet is based. They consist of nothing more than a string of English ASCII characters (only recently amended to allow other languages), licensed to registrars and end-users by a private corporation – the Internet Corporation for Assigned Names and Numbers (ICANN). Domain names are intangible items, rivalrous (and highly contentious, for the more popular and readable names), but lack any economic value outside the Internet’s Domain Name System (DNS). Should DNS, ICANN, or the Internet in its current form become obsolete, domain names would cease to have any value, despite being purchased for millions of real-world currency.
In these cases, virtual goods consumption resemble the trade of physical commodities in the real-world, and elicit similar kind of models of consumption. Unlike digital goods, which are typical consumed as media or experience goods, virtual goods have attributes akin to real-world goods that can be described and evaluated, without having to own the good itself – again, of course, within the shared context of the virtual world that they inhabit. A virtual hand bag is a hand bag within that world’s context; it is not a photograph of a bag, nor information about a bag [Lehdonvirta, 2009]. The definition of a virtual good, then, is perhaps best expressed as products stored and distributed in digital form, but created within the context of a virtual world or community and has economic value only within such context. Despite both types of goods being intangible digital objects, virtual goods are distinct from the commonly accepted category of digital goods.

Figure 1 provides visual examples of the different types of goods discussed in this section. Table 1 summarizes the previous discussion.

3 Markets for bytes

Having established some reasonably working definitions for digital and virtual goods, the issue now turns to another conundrum – how can property rights (and markets in general) exist for intangible bytes, and how can these goods be priced above zero when their supplies are theoretically infinite. Of course, markets do indeed exist for both digital and virtual goods. The core of their existence relies upon intellectual property rights regimes, though they use different legal mechanisms within those regimes to create rights of ownership. Pricing, in the face of theoretically infinite supply, are also very different for digital vs virtual goods – the former relies upon a combination of technological restrictions, incentives, and pricing strategies to solve its fundamental problem of non-scarcity, while the latter imposes scarcity within its own virtual context.
3.1 Owning bytes

The concept of property rights is often said to be the most important precondition (for example, in [Demsetz, 1967; Alston et al., 1995; Carruthers and Babb, 2000] for markets of a good to exist. This is intuitive, as markets not only facilitate the exchange of a particular good, but actually the various exclusive rights associated with the good (use, exclusion, alienability etc.). For the exchange of a good to occur in a meaningful way, these exclusive rights should exist.

For digital goods, property rights are established via intellectual property rights (IPR) regimes, in the form of copyrights, patents, or trademarks. In of themselves, digital goods lack scarcity, since making perfect copies is inexpensive, if not free. Rights of ownership must therefore include a means to exclude others from making arbitrary copies of the digital good in question, and IPR provide this exact means. In the case of MP3s, for example, copyright law outlines the a way for content owners to sell rights of use to others, but retain all other rights associated with the content. A detailed treatment of IPR and digital goods is out of scope for this paper, but the literature is sufficiently developed in this area – especially after the various trials involving digital music piracy – to establish clear (albeit disputed) property rights over typical digital goods.

For virtual goods, property rights are far less clear. Certainly, within the context of each virtual world, virtual goods tend to be treated in the same way as physical goods in the real world, with clear concepts of ownership. A sword owned by a character in the game Everquest follows similar rules as a sword owned by a person in the physical world, and are traded in the same way [Castronova et al., 2009]. However, once outside the virtual world context, it is unclear whether users have any real world property rights over their virtual possessions, even if real-world currency is paid for them. The precise real-world rights to virtual possessions is usually defined contractually between each user and the operator of the virtual world, via the end-user license agreements that the

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2In a comment on his blog regarding realistic economic behaviors in a virtual world, Castronova dryly remarks that “Being an elf doesn’t make you turn off the rational economic calculator part of your brain.”
user accepts upon joining. In most cases, these rights are very weak or nonexistent, allowing the operator to change the terms of the agreement or turn off the virtual world at any time [Sheldon, 2006], which can effectively destroy virtual property without compensation. Further, legal recourse in case of theft (for example, if an account is hacked and virtual property taken) is highly limited, and rarely involve any criminal sanction [Arias, 2008].

It is unclear how markets for virtual goods, especially those involving real-world currency, continue to exist in the face of this very weak set of property rights. Perhaps it is sufficient that strong property rights exist within the virtual world context, and that real-world property rights are generally unnecessary except in very specific circumstances when real-world concerns intrude upon the virtual context (such as the aforementioned issue of account theft).

3.2 Pricing

Another main concern for markets is the price of the good; in other words, for a market exchange to be meaningful, the good must have some value or worth to the buyer. In general, things that exist in purely digital form – once made – can be easily and perfectly copied. Under typical models of supply and demand, when a good has theoretically infinite supply, its equilibrium price point is zero. Selling digital and virtual goods, for their own value, appear to be an economic dead end. Yet markets do indeed exist for both types of goods; some other motivating factor must exist.

For digital goods, the viability of these markets appears to involve an assortment of technological and social motivations. The direct approach, as practiced early on by firms in the recording, publishing, film, and software industries, uses digital rights management to restrict content copying on end-user machines. This artificially reintroduced scarcity, but in practice, has negative effects on user experience and may be circumvented by sufficiently motivated end-users. Alternatively, alternative business models can be employed, as in the case of digital music subscription services – providing a rental model for access to unlimited library of digital music for a specific timeframe,
or in the case of iTunes – providing a bundle of other goods (iPod/iPhone/iPad) and experience (the convenience, quality, and selection) in addition to the digital good in question. Finally, sellers can introduce additional forms of value with a particular digital good – public recognition as a trendsetter, a donation to a non-profit cause, etc.

For virtual goods, scarcity is reintroduced by the rules of the virtual world context. While the good itself is a digital instantiation, the operators of the virtual world enforces a kind of digital rights management, in that the rules of the virtual world does not usually allow ordinary users to make arbitrary copies of the goods. In these cases, virtual goods again operate along the same lines as a physical good – as long as these goods can not be arbitrarily created from nothing within the virtual world, they can be made, bought, and sold like any other good in that world. Even for non-rivalrous cases like Farmville virtual goods, users are unable to make arbitrary copies of their goods by themselves, and direct exchanges of goods among users are strictly limited.

As for motivations for buying virtual goods, especially using real-world currency, motivations tend to fall into two types: functional, and hedonistic. First, by accepting the rules of the virtual world, users also implicitly accept the functional attributes of the good within that virtual world. Therefore, these goods have value within the virtual world, and can be acquired if the user is willing to pay its price for their function. For example, a sword in EverQuest has value in defeating opponents, one of the key activities of that world – if one accepts this as part of the EverQuest virtual world and participates in it, then the sword has functional value and generates demand. Second, there are also real-world hedonistic attributes to virtual goods, especially if those goods are shown to other users inside and outside that virtual world. Veblen [Veblen, 1912] first identified goods that the higher classes purchased not for their function, but solely to distinguish themselves from the lower classes, a motivation often shared by modern collectors of functionally useless but rare or esoteric goods [Lehdonvirta, 2009]. The same types of motivations apply to virtual goods – even if they serve no real-world purpose, they can be used to distinguish a collector from others in a social hierarchy, and thus have economic value within proper context.
4 Open issues

Digital and virtual goods are still relatively novel areas of research, and many open issues remain unresolved in the literature. For digital goods, the question of pricing with a fundamentally non-scarce good, especially relative to their physical-media counterpart, is still a thorny problem. The public discontent with New York Times’ digital subscription plans is an illustrative example of this. Taking into account mobile and tablet devices, the NYT tiered pricing model is strangely complicated and exceeds the price of its paper-based subscription (which itself is a bundle that confers free digital access), despite the fact that digital distribution is far less costly. Another example is e-book pricing, with some preliminary evidence suggesting that consumers are generally unwilling to pay physical-book prices for digital ebook goods [Loebbecke et al., 2010], perceiving the value of the digital version to be less than that of the physical copy. To maintain viable business models in selling digital information goods, these issues must be studied and resolved.

For virtual goods, two primary open issues yet remain: the lack of true property rights over virtual assets, and the lack of open standards across different virtual worlds. The first problem, as discussed in Section 3.1, threatens the entire market for virtual goods. If enough theft or other incidents convince consumers that virtual goods are in fact not sufficiently persistent, they may reassess the viability of their “property rights” over virtual items, and decide to no longer participate in virtual goods markets. The second problem limits virtual worlds to microcosms, as capital gained from one virtual world context is not easily translatable to another virtual world. With multiple virtual worlds emerging and rising in significance, and governments threatening to place taxes upon real-world currency transactions for virtual items, this will become a greater problem as time passes. Some approaches have already been devised. Linden Labs allows Second Life currency to be converted back to real-world currency, which can then be moved to other virtual worlds. However, this is imperfect and raises the specter of government intervention, as the practice has potentially inflationary effects.
on real-world currencies if occurring at scale and certain rules are not followed. A joint virtual-world currency exchange or standards for interoperability may be desirable.

5 Conclusion

In this paper, I have presented a brief analysis of digital and virtual goods, their key properties, and similarities and differences between the two types of goods. I described the basis on which both types of goods assert their status as viable real-world property, which forms the foundation of market exchanges. Several pricing schemes and motivations for demand were briefly discussed, in which the viability of selling intangible, copyable bytes is explored. Finally, I presented the open issues facing digital and virtual goods, including the issue of scarcity for digital goods and the problems with property rights for virtual goods. This remains a very exciting area for future economic research, especially as the digital information economy continues to develop, and new virtual worlds arise in which economists can not only observe and test existing hypotheses, but intervene and engineer the outcomes in more active experimentation.

References


