

## Peer treasure:

### how firms outside the software industry can use open source thinking

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## Abstract

The open source phenomenon is on its way to dominance of software, but can its methods be applied to other industries? This paper examines whether the economics make sense, and how firms can evolve to maximise their utility in the open source era. Whilst the paper explores broadening applications of open source thinking, there is not scope even to scratch the surface of the many burgeoning ‘open culture’ initiatives [*e.g.* **A**]. A basic understanding of the Open Source Definition [**B**] and ‘free software’ in terms of the GNU General Public Licence [**C**] is assumed.

[A] [http://en.wikipedia.org/wiki/Open\\_source\\_culture](http://en.wikipedia.org/wiki/Open_source_culture)

[B] <http://www.opensource.org/docs/definition.php>

[C] <http://www.fsf.org/licensing/licenses/gpl.html>

## The momentum of open source

The rise of the open source movement has led to the credible establishment of new and highly effective models in the software industry. From the idealistic roots of Richard Stallman’s Free Software Foundation [**1**], to the commercial pragmatism of Bruce Perens and the Open Source Initiative [**2**], a variety of peer-based, collaborative production methods have emerged and evolved; in many important sectors, software with open source origins now dominates. Examples such as Apache—which is run on almost 69% of all top level web servers [**3**—and Apple’s Darwin (the BSD-based foundation of OS X [**4**]), alongside the commitment of industry giants such as IBM, Novell and Silicon Graphics to use and develop flavours of GNU/Linux, all indicate substantial momentum; Vinod

Valloppillil's prescient 1998 observation in Microsoft's 'Hallow'een Documents' that open source software was "long-term credible" [5] inadvertently did much to validate the movement even further.

Since open source entered the informed public consciousness—most notably through Eric Raymond's *The Cathedral & The Bazaar* [6]—it has attracted the attention of economists and sociologists, attempting to rationalise the phenomenon in terms of existing theory, or proposing extensions of existing theory to accommodate the implications of the new models. Some have concentrated on the motivations of people who devote substantial amounts of time and 'mindshare' [7] to work on open source projects, through examining insiders' views [e.g. 8] or through motivational analysis surveys [e.g. 9]. Others have focused more on the business theory of open source, and it is the work of UC Berkeley's Steven Weber (*The Political Economy of Open Source Software* [10]) and, especially, NYU School of Law's Yochai Benkler (*Coase's Penguin, or Linux and the Nature of the Firm* [11]) which will be informative in this paper in terms of seeing the open source movement's implications for other industries.

## **Open source economics**

Standard economics would classify open source software projects, particularly those distributed completely without charge, as public goods, in that they are non-rivalrous (undiminishable), and non-excludable [e.g. 12]. He who receives a copy of software from me, receives the benefit himself without lessening mine (after Jefferson); unlike many public goods, though, open source and free software is not (generally) centrally provided by governments, but developed and delivered through communities—it has more in common with charitable or philanthropic work. It is not just non-rivalrous—network effects of an increased user base make each instance of the software *more* valuable, if anything [e.g. 13].

In *Coase's Penguin* [11] Benkler combines Ronald Coase's reasoning behind the existence of firms [14] and Harold Demsetz's theories of property rights [15] to form a system of idealised organisational forms (markets, commons, firms, common property régimes), with the relative efficiency of market exchange and organisation, and the value/opportunity costs of implementing a property system being determinants of which sector a particular good or activity will optimally be found. A firm results when organisation of an endeavour is more efficient than individual market exchange *and* the property system that results is worth more than its implementation costs.

However, since these options do not admit the possibilities of open source structures, Benkler extends the table by adding 'peering' as an organisational option, giving the following (slightly modified) [16]:

	Property system more valuable than implementation costs	Implementation costs of property system higher than opportunity costs
Market exchange of $x$ more efficient than organising or peering of $x$	<i>Markets</i> (example: farmers' markets)	<i>Commons</i> (examples: ideas, facts, roads)*
Organising $x$ more efficient than market exchange or peering of $x$	<i>Firms</i> (examples: cars, shoes)	<i>Common property regimes</i> (example: Dartmoor commons)
Peering of $x$ more efficient than organising or market exchange of $x$	<i>Internal proprietary 'open source' efforts</i> (example: Xerox's Eureka)	<i>Peer production processes</i> (examples: SETI@home, GNU/Linux development)

\*Note that Benkler makes no distinction here between rivalrous (e.g. roads) and non-rivalrous (e.g. ideas).

If "one treats all approaches to organising production as mechanisms by which individual agents reduce uncertainty as to the likely value of various courses of productive action" [17] then this demonstrates the potential value of peer-based methods: at the edge of what is certain, the enormous parallelism (and a certain degree of redundancy) inherent in peer production is bound to show up and correct defects and thus make "the likely value

of various courses of productive action” clearer—Linus’ Law, “given enough eyeballs, all bugs are shallow” [18]—without fixing the project into the path dependency so common with many endeavours, both governmental and technological.

Now that is almost a truism, not too different to the “million monkeys on a million typewriters” idea. Clearly if enough people (time, and money) are thrown at a problem, something will eventually result (although Frederick Brooks [19] and Cyril Northcote Parkinson [20] would heavily qualify that). The purpose of a firm, then, is to organise those monkeys and direct them down the correct path so that the uncertainty is reduced. And if that means path dependency, then that is fine, provided that it is a profitable path.

Extending this, however, is another dimension: the use of property. A firm reduces uncertainty by ensuring that it controls the property on which it is working, or has worked, so that no rival firm can use it. Yet the protection of property also costs, and so it may be that only projects where the implementation costs are less than the assumed value of the property rights ever get carried out by firms (exceptions are usually regarded as ‘failures’).

There is another side to this: by concentrating only on property it controls, a firm limits its resources enormously; as Benkler [17] says, “This strategy entails a systematic loss of allocation efficiency relative to peer production, because there are increasing returns to scale for the size of the sets of agents and resources available to be applied to projects and peer production relies on unbounded access of agents to resources and projects.” Peer production removes the efficiency barrier by allowing the employment of a larger set of resources without the implementation costs of a property system.

One might argue that since every player then has access to the same pool of resources, the ‘efficiency’ measure is transferred away from the individual firm, to a more collective efficiency, and thus since there is no difference between the efficiencies of firms, there is no real competition, and therefore no place for any firms within this system—by removing the competition, we have removed the incentives for innovation, and so on.

But this argument, in going to extremes, misses the point: all that is being suggested is that “peering could, *under certain circumstances* [my emphasis] be a more cost-effective institutional form,” [16] and it is some examples of applying this thinking that this paper is intended to address.

### **Peer-production within and without the firm**

Companies both inside and outside the software industry could well take the peer-production model and apply it internally (*i.e.*, in a way that is open source within the company, but closed source to the outside), even if on a limited scale, and to some extent, many companies already do.

For example, manufacturers with design and development facilities around the world routinely hold ‘contests’ between their studios when a new product is under consideration. The studios work in parallel developing solutions to the initial brief, and then the results are brought together at a central location (or, increasingly, online) with all those who have been involved present, along with whichever committee makes the decision. Often, the ‘best’ elements from the different submissions are selected—requiring a deliberate modularity to be built-in right from the start—and then the teams are merged, recombined, disbanded or reallocated as befits the project, to take the work forward.

BMW was a notable exponent of this policy during the 1990s, when acquisitions and expansion had provided the group with a multitude of R & D departments. The development of the new ‘MINI’ [21] involved proposals from Rover’s two centres (Canley and Gaydon), BMW’s Munich design centre and BMW’s Californian styling studios (as well as external consultants—for more discussion of which, see below). Features from a number of these proposals were assimilated—in this case, the Ivan Lampkin interior from the Californian BMW ACV30 concept, the packaging layout from David Saddington’s Rover

Evolution concept and styling from BMW’s Frank Stephenson. A similar process occurred with the new Range Rover [22].

‘Contests’ in general are clearly not identical with, for example, the development of GNU/Linux, since in a contest there is usually one winner and many losers. In the BMW contest, the external consultants who submitted ‘entries’ were the losers: their effort was unrewarded (beyond their consultancy fees) and any useful features that their work inspired in the subsequent project development were (subject to IP restrictions) taken from them: similar, then, to a ‘normal’ competition. The internal programmes did not lose out in the same way—other than creative frustration, perhaps. The groups soon found themselves working on each other’s concepts as the project progressed, just as open source software developers build on each other’s work (BMW is not the clearest-cut example to use here, given subsequent events [*e.g.* 23], but it’s an example where the proposals have become semi-public).

The peer-developed *internal* development programmes in the BMW example above are surely more analogous to a corporate version of the open source software process, except that with GNU/Linux there has not been just a single ‘bringing-together’ of the developments, but many tens of thousands—enough to make it, effectively, a *continuous process*.

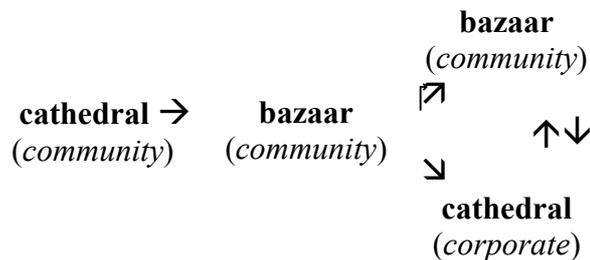
Using Eric Raymond’s terminology [6], the BMW example might be classified as:

**cathedral** →      **bazaar**      → **cathedral**  
(*corporate*)      (*corporate*)      (*corporate*)

Initial direction on the project came ‘from the top’ (cathedral-style), then the project progressed to some extent in a bazaar style, with elements of designs being combined, until the design was ‘frozen’ and taken back under cathedral-style control to result in a single, coherent final product: the project remained internal, within the firm (apart from the consultancy inputs to the bazaar stage).

GNU/Linux has followed a much more diverse path, but it would be a mistake to think that it is ‘all bazaar and no cathedral.’ Weber [10] says, “Linux, in its earliest days, was run unilaterally by Linus Torvalds. Torvalds’ decisions were essentially authoritative,” and Raymond [24] concludes that “it would be very hard to *originate* a project in bazaar mode.”

The message is clear: it is the *expedient* use of the cathedral or the bazaar approach which makes the most of each method—and indeed, expedient use of (corporate) internal and (community) external development. Companies such as Red Hat [25], in taking on commercial development of GNU/Linux distributions, have produced something which conforms to a more ‘cathedral’-like approach, whilst building on the achievements of the bazaar (which continues unabated in parallel). Perhaps the GNU/Linux story (simplified) looks something like this:



What’s important to note is that whilst the corporate cathedrals of companies such as Red Hat are free to impose whatever direction they like on the development of code to produce a commercially viable product (perhaps for specific applications, such as embedded Linux in electronic consumer products [26]), the community bazaar code they adopt and adapt is licensed under the GNU GPL, so they “must give the recipients all the rights that [they] have,” [27]. The corporate code must be returned to the community bazaar. Hence the extra interaction arrows at the ‘end’: the process is ongoing.

Just as car dealers make more money in the long-run from servicing the cars they sell than the margin on new cars, so Red Hat, SuSE, Mandrake and other commercial

Linux distributions make the majority of their income from the value they add to the code incorporated into their products. These firms offer guaranteed ancillary services, such as specialist technical support, documentation and customisation to their customers, many of them businesses which want reliable systems. The characteristics of ‘the firm’ suit this better than a nebulous community: central organisation is key to such efforts, and since much spread of software comes from word-of-mouth, reputation-based recommendations, companies proving themselves will achieve the ‘halo’ desired [28].

Could this apply to other industries where value added offers the biggest scope for returns? One could argue that any company that repackages or resells a public domain product (such as the Bible, or Shakespeare) is engaged in this, but there is not the same peer community working on these books. There is no improvement in the base material.

A better example would be seed growers [29], or small farmers in general (both arable and pastoral), who have been building on the work of their forebears in seed selection and selective breeding for tens of thousands of years to produce the varieties of food we enjoy today (and hence the threat to their ‘open source paradigm’ as it becomes tangled in a web of IPR [*e.g.* 30]). A farmers’ collective (or genuinely ethical supermarket such as Waitrose [31]) which adds value to these products, through better distribution, or attractive packaging, or promotion to new markets, can run profitably as a commercial operation, despite not owning the intellectual property on which it bases its business—and, crucially, return to the ‘bazaar’ the finances needed to keep it alive. Open source and peer-production is clearly applicable to more than just the software business.

## **Applying the lessons**

How could, say, a consumer product manufacturer organise itself to involve an external community usefully in its development process?

In the formative years of many industries, “early customers tended to be treated as an extension of the development department” [32], and whilst most consumers today would recoil in horror if expected to participate in the testing phase of a product they had bought, there are fields where—aside from actual ‘pilot groups’—enthusiastic groups of user-developers have the potential to influence manufacturers’ development processes. Independent rally/racing teams, often in competition with works’ teams, have spurred many useful advances in vehicle engineering, helping individual manufacturers considerably. Increasingly in consumer electronics, groups of ‘modders’ have become significant in the development of products such as Apple’s iPod, with communities such as the magazine/web-site MAKE (‘technology on your time’ [33]) starting trends leading to features being incorporated in new iterations of the original product. Providing these communities are prepared to work with the companies involved, the bazaar could well decide the cathedral’s strategy.

Beyond existing companies, open source ideas are increasingly being applied to hardware, with groups such as ThinkCycle, “a Web-based industrial-design project that brings together engineers, designers, academics, and professionals from a variety of disciplines” [34] developed by MIT’s Media Lab [35], in a collaborative, peer-production environment. One of ThinkCycle’s co-founders, Saul Griffith, has recently proposed a new project to develop an open source hybrid car [36].

But—as with so many innovative developments in technology—how can bazaar projects make a real transition to widespread use? Physical products cannot be copied at no cost in the same manner as software. It will necessarily have to be the *information* that is spread freely; Griffith’s open source car may well end up being a set of plans for self-assembly. Nevertheless, an industry of small companies may grow up to provide components and expertise to open source hardware, just as there is, for example, a healthy crop of firms which provide spare parts, build services, and so on, for kit-car builders [*e.g.* 37].

If the ‘community’ is to remain paramount (and manageable) within these projects, some discipline in the bazaar is probably essential. Much of the success of GNU/Linux is arguably down to the considered rigour of Stallman’s GPL; something similar may be needed in open source hardware projects.

In *Small Is Beautiful*, E.F. Schumacher uses the example of Scott Bader [38], a plastics firm with very strict principles, placed in the ownership of a commonwealth of its employees by its founder, and which has remained true to his humanitarian tenets for more than 50 years [39]; one of the principles which may be particularly apposite here, in terms of keeping open source projects disciplined, is the idea that the firm must never grow above 350 employees. At that point, a new, separate company will be set up, independent of the parent and free to develop in its own way provided it retains the same principles. It is easy to see how this model agrees well with keeping the bazaar spirit intact; it certainly prevents the path dependency which may begin to take hold in larger organisations. Indeed, some open source projects have already begun to model themselves on the Scott Bader principles [40]. The UK’s new Community Interest Companies, starting in summer 2005 [41], may also offer some opportunities in this area, for ‘social enterprise’ projects making a transition to commercial operations.

## **Conclusion**

Overall, peer-production and open source are not as simplistic as “collaboration replaces the corporation” [34]. The way forward will involve the appropriate use and interaction of different organisational forms; there is no reason why this cannot be done on an economic basis. As the Open Source Initiative proclaims, “the economic self-interest arguments for Open Source are strong enough that nobody needs to go on any moral crusades about it.”

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