

The patent management trichotomy: Patenting, publishing, and secrecy

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Abstract

Purpose

Extant research and practice of patent management are often occupied with how to best utilize patenting as a source of competitive advantage. This paper instead suggests a patent management trichotomy where firms make strategic decisions between patenting, publishing, and secrecy.

Approach

The paper is conceptual in nature and draws on received IP-management literature to develop an analytical framework.

Findings

We suggest that the choice between patenting, publishing, and secrecy can be understood in terms of differences in the degree to which the firm can appropriate value from the invention and the degree to which it can operate freely.

Originality/value

Through an analysis along the dimensions of direct and indirect appropriation as well as static and dynamic freedom to operate, the article conceptualizes the choice between patenting, publishing, and secrecy in a way useful for management decisions as well as for academics.

Keywords: *Patenting; defensive publishing; strategic disclosure; secrecy; intellectual property management; innovation*

1 Introduction

The preceding decades have witnessed an explosion in patenting (e.g., Hall 2005) - we can even speak of a pro-patent era (Granstrand, 1999) where the importance of IP management has grown enormously (e.g., Granstrand, 1999, Hemphill, 2013, Somaya, 2012). Today, we understand that technological resources often become the basis for competitive advantage and drivers of tremendous success and great fortune. The achievements of companies such as Apple, Google and more recently Tesla are but a few examples. We also understand that the control of such resources in the form of patents and intellectual property rights (IPRs) are critical in appropriating from technological inventions (Agostini et al., 2015, Itami and Roehl, 1987, Lavie, 2006, Teece et al., 1997, Teece, 1998). However, recent literature on innovation and technology management has clearly demonstrated that not only tight and proprietary control over technologies are conducive to firm success (e.g., Baldwin and von Hippel, 2011, Harhoff et al., 2003, O'Mahony, 2003, von Hippel, 2005, Ziegler et al., 2014). For example, sometimes it is beneficial to share technologies with other actors, e.g. to improve the competitiveness of a larger technological system and/or to benefit from complementary innovations, products, and services. A firm can then benefit from strategically disclosing certain inventions instead of patenting them, in order to enable a community of innovators to contribute to a technology (Peters et al., 2013). In other cases a firm may benefit from keeping inventions secret in order to limit possibilities for competitor invent-around (Granstrand, 1999). Each one of these strategies – patenting, publishing and secrecy – have been covered extensively in previous research studies, even though research has been clearly biased towards patenting, often without considering its alternatives (Candelin-Palmqvist et al., 2012). In this paper, however, we address the *patent management trichotomy*. Specifically, we investigate the strategic decision firms make – at the level of the invention – *between* patenting, publishing and secrecy. Doing so we develop a conceptual framework that views patenting, publishing and secrecy as substitute choices associated with distinct advantages. Foreshadowing our findings, we suggest that the patent management trichotomy and the choice between patenting, publishing and secrecy can be understood in terms of whether the strategy (1) generates appropriation advantages and/or (2) increases the firm's freedom to operate. In the following we first develop a conceptual framework based on these two dimensions, we subsequently suggest a number of propositions that outlines advantages of each strategy, and finally we discuss implications for theory and practice.

2 Towards a patent management trichotomy

2.1 The functions of patents

Patents are commonly misinterpreted as giving inventors the right to make or sell an invention. Being granted a patent does not mean that you have the right to practice that invention. Rather, patents provide the right to exclude others. Patents give their holders “the right to prevent third parties from making, using or selling the [patented] invention without their owners’ consent” [1]. By preventing imitation, patents enable innovation appropriation (value capture). Enabling appropriation is one important function of a patent [2]. Another function is to protect the freedom to operate (FTO) of the patent holder. Patents not only provide the right to exclude others, but also block others from excluding the patent holder, effectively protecting the freedom to operate. The logic is simple: as patents contribute to prior art (meaning that the invention has been made known to the public), no one else can patent the same thing later on, and thus no one else can exclude the patent holder from using its invention. Otherwise a firm that uses a non-patented invention not known to the public could be forced to either stop using the invention or to sign a licensing agreement should someone decide to patent such an invention – thus limiting the firm’s freedom to operate.

2.2 Antecedents to the patenting decision

The decision to patent depends on a number of factors (see Table 1 for summary with references). First, the innovation type impacts the effectiveness of various means. Typically, product innovations are more suited for patent protection (relative to secrecy) than process innovations. Second, as for most types of strategies, there are differences between large and small firms in terms of how effective various protection strategies are, and patenting has been found to be relatively difficult for small firm to benefit from. Third, different industries are to various extent suitable for different types of protection strategies, due to the characteristics of the technologies, the legal situation (patent protection is for instance not applicable to all types of technologies), or something else. Fourth, the IP regime and the IPR laws and institutions available in either an industry or a nation impact the available managerial strategies. Patent protection on a market requires not only patent laws, but also that such laws are enforced (while monitoring is typically left to patent holders). Fifth, the market structure impacts the effectiveness and efficiency of various types of strategies. If a market is guarded by other means, for instance by state monopolies, it might be inefficient to protect it also by patent protection, since that is costly.

In the following we discuss two important functions of patents – appropriation and freedom to operate – and identify two substitutes to patenting – secrecy and

publishing. These substitute strategies to a varying degree fulfill similar functions as patents do – and thereby lay the foundation for the patent management trichotomy.

Table 1 Examples of factors impacting the decision to patent, publish, or keep secret

Factor	Examples	References (examples)
Innovation type	Process Product Service	Arundel and Kabla (1998), Brouwer and Kleinknecht (1999), Granstrand (1999)
Firm size	Large Small	Arundel and Kabla (1998), Brouwer and Kleinknecht (1999), Davis (2006), Hanel (2006), Kitching and Blackburn (1998), Mansfield (1986)
Industry	Chemical Electronics Mechanical Pharmaceutical Software	Chabchoub and Niosi (2005), Granstrand (1999), Hall and Ziedonis (2001), Mansfield (1986), O'Mahony (2003), Scherer (1983)
Technological complexity	Complex ('Mul-tech') Cumulative Discrete	Bessen (2004), Bessen and Maskin (2009), Cohen et al. (2000), Granstrand et al. (1997), Hall and Ziedonis (2001), Somaya et al. (2011), Teece (2009)
IP regime	Strong Weak	Granstrand (2006), Hu and Jefferson (2009), Keupp et al. (2010), Teece (1986, 2006)
Market structure	Competition Monopoly Oligopoly	Bekkers et al. (2002), Blind and Thumm (2004), Granstrand (1999)

2.3 Innovation appropriation strategies

Innovation activities aim to create something new and useful. However, most innovators are not only concerned with value creation, but also value capture, i.e. to capture returns and profit from the innovation activities. The ability to capture returns from R&D investments and other innovation activities are commonly called *appropriability* (Levin et al., 1987, Teece, 1986). The appropriability regime – i.e. that extent to which inventions can be prevented from imitation – is related not only to legal impediments (patents, copyrights, etc.) but also to the nature of the technology (product/process, tacit/codified) (Teece, 1986, Teece, 2006). In case of a “tight” appropriability regime (meaning that imitation is difficult), the innovator will likely collect a large share of profits from innovation. By contrast, when imitation is easy, access to complementary assets is central to capture returns from

innovation (Teece, 1986). Teece (1986) early argued that tight appropriability regimes are rare, and that controlling complementary assets is therefore at core for innovators to appropriate returns from innovation. However, Teece as well as others have subsequently identified that appropriability is not exogenously given in an industry, but can be endogenously shaped by firms, governments, and technological change (Granstrand, 1999, Pisano, 2006, Pisano and Teece, 2007, Somaya, 2012, Teece, 2006). In addition, subsequent research have identified that tight appropriability regimes are not necessarily always most conducive for firm profitability (Dahlander and Wallin, 2006, Pisano, 2006), especially in industries where innovation is cumulative and complementary (Teece, 2009, David, 1993).

The fact that the appropriability can be endogenously shaped means that appropriation strategies are important for enabling firms to capture returns from their innovation investments. A number of empirical studies have studied the relative effectiveness and importance of various means and strategies of protecting new products and processes. The effectiveness of different means varies widely across industries. For example, patents are typically more effective for product innovations than for process innovations (Granstrand, 1999, Levin et al., 1987). Still, the effectiveness of patents has been found to be limited relative to other means in numerous studies (Brouwer and Kleinknecht, 1999, Cohen et al., 2000, Granstrand, 1999, Harabi, 1995, Kitching and Blackburn, 1998, Leiponen and Byma, 2009, Levin et al., 1987).

The relatively low effectiveness of patents for appropriation can be related to some of the drawbacks with patenting. The main perceived drawbacks are the possibilities for competitors to legally invent around patents (illustrating the rareness of tight appropriability regimes, despite patent protection) and the information disclosure related to patenting (Harabi, 1995, Levin et al., 1987), as well as the high economic and non-economic costs of patenting (Cohen et al., 2000, Kitching and Blackburn, 1998).

Firms typically rate informal means of appropriation more effective than patenting, and thus turn to sales or service efforts, market lead times, learning and cost reductions, secrecy, and switching costs to appropriate returns from their inventions. Most of these appropriation strategies can be used as complements to patenting on the level of an individual invention (Holgersson, 2012), for example in multi-protection strategies (Granstrand, 1999).

Rather than being complements to patenting (i.e., being used simultaneously) – again, at the level of the individual invention – two strategies are substitutes to patenting (i.e., the strategies cannot be used simultaneously at the level of the individual invention). First, secrecy is a mutually exclusive alternative (substitute) strategy to patenting (Arundel, 2001). A trade secret has been defined as “information, including a formula, pattern, compilation, program device, method,

technique, or process that (1) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means, other persons who can obtain economic value from its disclosure or use, and (2) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy” (the Uniform Trade Secrets Act of 1985). While a patent gives its holder a temporary and limited monopoly advantage in exchange for the publication of the invention and various fees, secrecy provides a monopoly advantage as long as the secrecy remains secret, which might require significant efforts (Hannah, 2005), or as long as it is not independently developed by someone else. Thus, patenting and secrecy are substitute strategies to appropriate returns from innovation. Second, publishing is similarly a mutually exclusive alternative (substitute) strategy to patenting as an inventor cannot publicly disclose an invention and at the same time patent that invention. We use the concept of publishing to denote the act of publicly and strategically disclosing information, or more precisely “the act of creating novelty-destroying prior art in order to prevent or impede another agent from being able to obtain IP protection on the same or a similar invention or artistic or literary creation” (Peters et al., 2013, p. 122). The advantages of publishing, however, mainly pertain to freedom to operate and the co-creation of value as discussed later. We will now analyze these three strategies – patenting, publishing, and secrecy – more carefully along our two dimensions of interest – appropriation and freedom to operate.

Appropriation refers to whether the strategy contributes to the firm’s ability to capture returns from investments in innovation (cf. Arundel, 2001, Granstrand, 1999, Levin et al., 1987, Teece, 1986, 2006, Holgersson, 2013). Firms can *appropriate directly* through the sales of products, services and licenses based on a specific technology (Cohen et al., 2000, Somaya, 2012). Technology exclusivity, in turn, can be protected by patents or trade secrets (Arundel, 2001, Granstrand, 1999). Numerous studies have found that the protection of innovations and prevention of imitation is the main motive for patenting (Arundel et al., 1995, Blind et al., 2006, Cohen et al., 2000, Duguet and Kabla, 1998, Giuri et al., 2007, Granstrand, 1999, Thumm, 2004a, Veer and Jell, 2012, Thumm, 2004b). Publishing is not associated with such benefits, while secrecy is (Arundel, 2001, Hannah, 2005). This leads to the first proposition.

Proposition 1. Value appropriation is better achieved through patenting and/or secrecy than publishing

Whether patenting or secrecy is the superior strategy to appropriate value depends in part on the degree of complexity in the underlying technology, in terms of

interdependency of multiple inventions across organizational boundaries (Cohen et al., 2000, Granstrand et al., 1997, Somaya, 2012). Studies have found that firms patent to avoid trials and to reach strong positions in negotiations (Arundel et al., 1995, Duguet and Kabla, 1998, Granstrand, 1999), to block other firms' R&D and patenting efforts (Cohen et al., 2000), and to attract customers and venture capital (Holgersson, 2013). Additionally, in industries where standards are of importance, for instance in telecommunications, the possibility to reach a strong position in the standard by patenting essential inventions is an important motive to patent (Bekkers et al., 2002, Granstrand, 1999). What firms seek here are *indirect appropriation advantages* from patenting, without a direct link to the sales and margins of the patented technology. Most of these advantages become increasingly important with increasing technological complexity, for example since opportunities for interorganizational technological combinations increase (cf. Somaya et al., 2011). This leads to the second proposition:

Proposition 2. As technological complexity increases, value appropriation is better achieved through patenting than secrecy

2.4 Freedom to operate

One important difference between patenting and secrecy is that while patenting leads to a registered disclosure of the patented invention, secrecy requires that there is no disclosure of the invention. One downside with patenting is therefore that the patent will provide competitors with information useful for imitation (Anton and Yao, 2004, Horstmann et al., 1985). However, this also means that, in contrast to secrecy, a patenting strategy will contribute to prior art, safeguarding some level of freedom to operate. Freedom to operate is important, since it means that a specific commercial business can be undertaken without infringing valid IPRs held by others within a certain domain.

Patenting aims not only to “block competitors from using a technology and in so doing increase their costs and time for imitation and/or for inventing around the patent, in order to increase their willingness to pay for a license or to stay away from a market” but also to “block the competitors from blocking oneself” (Granstrand, 1999, p. 214). A secrecy strategy on the other hand runs the risk of having the invention patented by someone else, inhibiting the commercial opportunities for the firm utilizing a secrecy strategy. This is an inherent risk with relying upon trade secrecy protection [3].

Thus far we have established that patenting protects the firm's freedom to operate while secrecy does not. In addition to patenting, firms can strategically disclose

information about an invention as a means to protect its freedom to operate. As patentability requires novelty of the invention firms can limit other actors' possibilities to patent through *defensive publishing* (also known as *strategic disclosure*) that "exhaust" the novelty of the invention (Bar, 2006, Barrett, 2002, Johnson, 2014, Parchomovsky, 2000, Peters et al., 2013). In other words, the publication strategy protects the firm's freedom to operate by – similar to the patenting strategy – "block[ing] the competitors from blocking oneself". This way, patenting and publication may reach the same goal in terms of freedom to operate although they are substitute strategies (as publishing exhausts future patentability) [4].

It is here important to note that neither patents nor publications provide the inventor with perfect freedom to operate; exclusive rights (e.g., patents) related to necessary complementary resources may be held by other agents restricting and blocking the freedom to operate, possibly leading to hold-up problems (Lemley and Shapiro, 2007) and tragedies of the anticommons (Heller, 1998, Heller and Eisenberg, 1998). Available reactive solutions include integration, acquisition of blocking rights, contractual agreements (license agreements), invalidation of blocking rights, and infringement (Granstrand, 1999, Granstrand and Holgersson, 2013). However, both patenting and publishing ensure *some level* of freedom to operate, in contrast to secrecy that does not ensure any freedom to operate [5]. This leads to the third proposition:

Proposition 3. Freedom to operate is better achieved through patenting and/or publishing than secrecy

There are some important differences between patenting and publishing in that patenting typically requires more time, more money and a higher inventive step than publishing, which is why publishing is sometimes preferred by firms lagging behind the most innovative firms in order to stop the innovators from patenting (Parchomovsky, 2000). Whether patenting or publishing is the superior strategy to achieve greater freedom to operate also depends in part on the degree of complexity in the underlying technology. Neither patenting nor publishing enable perfect freedom to operate, operations can still be inhibited by the IPRs held by other firms. However, with a portfolio of patents a focal firm has a defensive bargaining position that can be used to enable various types of licensing agreements easing the blocking power of other IPR holders (cf. Lemley and Shapiro, 2007, Hall and Ziedonis, 2001), especially in complex technologies where the other IPR holders are dependent upon the focal firm's patents (cf. Pfeffer and Salancik, 1978, Shapiro, 2001). To gain such bargaining power, and thereby to access (licenses to) other

firms' IPRs, is one reason for why technology firms (such as Google) acquire large patent portfolios (from Motorola) (cf. Bogers et al., 2012b) [6]. A publication strategy, however, does not provide any property rights useful for bargaining. It is useful to make a distinction between *static* and *dynamic* freedom to operate. We introduce this distinction to denote on the one hand the freedom for business to operate based on current technologies (static freedom to operate) and on the other hand the freedom for business to operate based on future developments and improvements of current technologies (dynamic freedom to operate, see Proposition 5). This leads us to the fourth proposition:

Proposition 4. As technological complexity increases, (static) freedom to operate is better achieved through patenting than publishing (and secrecy)

Whether patenting or publishing is the superior strategy to achieve greater freedom to operate also depends upon the degree of cumulativeness in the underlying technology: When innovations and technologies are highly cumulative, future technologies build on previous ones (cf. Merton, 1973, Katila and Ahuja, 2002, Merton, 1968, Hargadon and Sutton, 1997). Previous patents held by one actor may then inhibit commercialization opportunities of future technologies for others, just as an innovator's path may become blocked by complementary patents in the future (Rai, 2001, Chang, 1995, Bessen and Maskin, 2009, Murray and O'Mahony, 2007, Bessen, 2004). Again, a firm with a strong patent portfolio can avoid future hold-up problems related to updated technologies, for example through cross-licensing agreements and various grant-back and assign-back license clauses (Granstrand and Holgersson, 2014). Thus patenting not only ensures some level of static freedom to operate, but also dynamic freedom to operate. Publishing does not provide the same level of dynamic freedom to operate. This leads to the fifth proposition:

Proposition 5. As technological cumulativeness increases, (dynamic) freedom to operate is better achieved through patenting than publishing (and secrecy)

3 Discussion

We began by observing the explosion in patenting. The phenomenon is not limited to the US but the pro-patenting era has embraced large parts of the developed and developing world, most notably in Europe and Asia. Today, research acknowledge that the patent system is but one of many ways to incentivize investments in R&D

and to diffuse knowledge in the economy (David, 1993; Granstrand, 2003; Greenhalgh & Rogers, 2010; Scotchmer, 2004; Wright, 1983). Our paper provides an original contingency framework that complements previous patent management research and outlines the choice between patenting, publishing and secrecy – the patent management trichotomy. Doing so, our paper highlights differences between these strategies and contributes to a more nuanced debate about the choice to patent or not, differences that are summarized in Figure 1. A number of contributions are discussed below.

		Freedom to operate		
		None	Static	Dynamic
Appropriation advantage	None		Publishing	
	Direct	Secrecy	Patenting	
	Indirect			

Figure 1 The patent management trichotomy

First, by providing both static and dynamic freedom to operate and both direct and indirect appropriation advantages patenting is the strategy that presents the largest breadth of available commercialization strategies, not only by in-house production and marketing but also by patent sales (cf. Arrow, 1962, Tietze, 2012) and various types of licensing schemes (Alexy et al., 2009, Bogers et al., 2012a, Chesbrough, 2003, Granstrand and Holgersson, 2013, Granstrand and Holgersson, 2014), indicating the value of patents as real options (Somaya, 2012, Bloom and Van Reenen, 2002, Nerkar et al., 2007).

Second, our framework leads us to consider different forms of hybrid strategies. For example, by combining patenting with free licensing a strategy with characteristics close to those of publishing can be obtained (Ziegler et al., 2014), while maintaining the real options of patenting, such as improved accessibility potential to future technological developments through various license clauses (cf. O'Mahony, 2003, Granstrand and Holgersson, 2014). With that said, such options come at a price related to the direct and indirect costs of patenting (Holgersson, 2013).

Third, we underscore the importance of understanding the systemic and dynamic nature of inventions. Here, we honed in on technological complexity and cumulateness. Our propositions resonate with previous research suggesting that larger patent portfolios lessen hold-up risks in fragmented markets with many unknown technological dependencies (Cohen et al., 2000, Hall and Ziedonis, 2001, Jell et al., forthcoming).

Fourth, while we treat the strategies of patenting, publishing and secrecy as substitutes on the single invention level, it is important to consider the combinatorial possibilities across time and across technologies. Patenting is always preceded by some kind of secrecy to uphold the novelty and thereby the patentability of the invention. After a patent application has been filed, the firm can choose to publish the invention through various channels in addition to the patent publication, for example in order to publish sooner than the time when the application is published (typically 18 months after filing). The firm may want to signal its intentions and future patents in order to keep other firms away from doing R&D in the same direction or to establish a dominant design (Peters et al., 2013). A firm can also combine different strategies for different but related inventions (cf. Liebeskind, 1996, Thomä and Bizer, 2013, Arora, 1997). For example, in a product system consisting of multiple modules one module may be effectively protected by secrecy, while a second module is protected by patents, and the inventions of a third module are published to enable cheap substitutes or complements at competitive prices to benefit the product system as a whole (Henkel et al., 2013).

Fifth and finally, it is clear that the strategic decision between patenting, publishing, and secrecy has to be aligned with corporate strategies and environmental factors in order to reap the full potential of the technological resources (Alexy et al., 2009, Granstrand, 1999, Phelps and Kline, 2009, Reitzig, 2007). Thus, IPR strategies is a concern that should not be dealt with by IPR departments in isolation, but rather in close interaction with technology, business, and corporate strategies more generally.

Our research also points to interesting avenues for future research. The most obvious path is to extend the analysis beyond appropriation and freedom to operate to include the creation of value in open settings. The contingency framework we develop is focused on (and limited to) technology, value appropriation, and freedom to operate. As such the framework may give undue priority to patenting. What we have demonstrated is that patenting is likely a superior strategy when firms are considering issues pertaining to appropriation and freedom to operate. However, firms need to consider antecedents to appropriation. For example, patent management – and more generally IP management – must ask how a chosen strategy supports or enable value creation. Indeed, both patents and publishing have another function – beyond enabling appropriation and freedom to operate – to allow

for the co-creation of knowledge. While patenting grants the inventor the right to exclude others from using the invention, patenting, as well as publishing, also discloses knowledge about the invention that allows others to build on that knowledge. An important rationale from governments to support the institution of patents is to create incentives to disseminate knowledge to the public, which others can subsequently build upon. Future research should address the patent management trichotomy with this in mind and incorporate value co-creation in their analysis. In such open landscapes publishing may rule over both patenting and secrecy. Here, a fruitful avenue for future research would be to incorporate the patent management trichotomy into a growing stream of literature on open business models, where value capture and value creation – but not freedom operate – are central components (cf. Chesbrough, 2013). This is probably also a useful setting for testing the framework empirically. More specifically the framework could be tested in a digitalization setting where complexity, cumulateness, and new business models require appropriation as well as freedom to operate to different degrees for various (types of) inventions.

4 Conclusion

This article has sought to bridge the gap in extant literature on the relations between patenting, publishing, and secrecy, and the specific characteristics of these strategies.

The patent management trichotomy was introduced, as well as the notions of direct and indirect appropriation advantage and static and dynamic freedom to operate, pointing at the characteristics of patenting, publishing, and secrecy, respectively. This has emphasized substitute strategies to patenting that patent management must consider, where secrecy provides direct appropriation advantages, publishing provides static freedom to operate, and patenting provides direct and indirect appropriation advantages as well as static and dynamic freedom to operate.

This article has highlighted that patent management is not only about patenting, it is also about considering alternative strategies such as publishing and secrecy. Future research and practice should to a larger extent acknowledge the alternatives to patenting, their specific characteristics as described here, as well as the possibility to create hybrid strategies and combinations of strategies across inventions and time.

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Notes

1 See the European Patent Office: <http://www.epo.org/applying/basics.html> [Accessed 12 March 2016].

2 There are many other motives to patent too, see Holgersson (2013) for a review of that literature.

3 This is true also in the US after its America Invents Act (2011), where the first-to-invent criterion of patentability was changed to the first-to-file (a patent application) criterion.

4 While patenting also includes publishing, we here separate between a pure publishing (not including a patent application) and patenting (including the publication of a patent application). For combinatorial possibilities, see Peters et al. (2013).

5 It is noticeable here that a patenting strategy must always be combined with a secrecy strategy of some sort, albeit at different times of the innovation process. Before the patent application is registered, the invention must be held secret not to exhaust the patentability of the invention (cf. Hussinger, 2006).

6 In an infringement case in 2012 in which Yahoo (plaintiff) accused Facebook (defendant) for patent infringement, Facebook counterclaimed that Yahoo was infringing ten of Facebook's patents. Eight of these ten patents had been purchased by Facebook with the sole purpose to gain retaliatory power, according to Yahoo. This case eventually ended with a settlement, probably under terms much different from what Yahoo had hoped. See Ewing (2012) for a more detailed account on this case.