The Role of Consumer Preference Development in Incremental Innovation: How Diamond Multimedia Helped Create the iPod*

The first digital music players, Eiger Labs's MPMan and Diamond Multimedia's Rio, were introduced to the American market in 1998. When Apple Computer released the iPod in 2001, total digital music player sales remained at $100 million, roughly the same level as in 1998.[1] Four years later, Apple held seventy-five percent of a more than $4 billion market.[2] But the strongest evidence of the iPod's popularity is not statistics; it is personal experience—one can hardly walk through a crowd without seeing the distinctive white earbuds.

What made the iPod, rather than another player, a necessity for the American consumer? How was Apple able to succeed where its competitors failed? In addition to applying its considerable product design and manufacturing expertise, Apple also benefited from the earlier product releases. Before Eiger Labs and Diamond unveiled the first players, consumers were unfamiliar with players' capabilities.[3] By contrast, Apple entered the market after consumers could articulate what features they wanted and how much they would pay for them. It achieved tremendous success, in large part, by correcting the flaws in its competitors' products.[4] Purchasing, observing, using, and reading reviews of the earlier products developed consumer

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1. Mintel Reports, Emerging Technologies: MP3 Players - US - September 2004 - Market Size & Trends (2004), http://academic.mintel.com/ (follow "reports" tab; then follow "Mintel Reports: USA" hyperlink; then follow "Electronics" hyperlink; then follow "Emerging Technologies: MP3 Players - US - September 2004" hyperlink; then follow "Market Size & Trends" hyperlink).

2. Mintel Reports, MP3 Players and Other Portable Audio Players - US - June 2006 - Market Segmentation (2006), http://academic.mintel.com/ (follow "reports" tab; then follow "Mintel Reports: USA" hyperlink; then follow "Electronics" hyperlink; then follow "MP3 Players and Other Portable Audio Players - US - June 2006" hyperlink; then follow "Market Segmentation" hyperlink); U.S. Digital Music Player Sales, by Share, 2005–06 (Sept. 18, 2006), http://academic.mintel.com/ (follow "search" tab; search for "digital music player sales" in "News and Other Databases"; then follow "2006-09-18 U.S. digital music player sales, by share, 2005-06" hyperlink).

3. *See* John Lobato, *Paying for the Sins of Their Users: Liability and Growing Uncertainty in a Digital Age:* Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd., *125 S. Ct. 2764 (2005)*, 29 HARV. J.L. & PUB. POL'Y 357, 369–71 (2005) (noting the Rio as a "novel audio tool" that initially prompted lawsuits from the record companies).

4. Rick LePage, *Five Reasons the iPod Succeeded*, PLAYLIST, Oct. 22, 2006, http://playlistmag.com/features/2006/10/ipodfive/index.php.

preferences, giving consumers an idea of what they wanted in a digital music player. Apple was then able to build a product targeted to meet those desires.

The consumer preference development that takes place when a product is sold is an externality—a benefit conferred or a cost imposed on third parties to a transaction.[5] Apple's competitors were not compensated for creating the valuable preferences that helped Apple design the iPod. Externalities lead to market failures—when costs are imposed on third parties, transactions occur that benefit the participants but harm society as a whole; when benefits are conferred on third parties, transactions fail to occur that would harm the participants but benefit society as a whole.[6]

Governments normally respond to these potential market failures with regulation. Intellectual property laws, for example, internalize the positive externality of technological research by preventing the use of inventions without permission of the inventor.[7] Traditional regulatory mechanisms include direct legislation mandating or forbidding behavior (referred to as command and control), providing subsidies to encourage or taxes to discourage activities, and encouraging market solutions by establishing property rights. The nonexistence of any mechanism for rewarding companies for generating consumer preferences suggests that insufficient incentives currently exist for product release.

In some markets, this danger is particularly pronounced. While product releases in any market will further develop consumer preferences, "radically innovative markets" such as the early digital music player market, are characterized by nonexistent preferences.[8] These markets arise from technology that destroys the competencies of existing companies and that results in a major change in consumer habits and behaviors.[9] The release of varied products by companies with different visions then plays a particularly crucial role in developing consumer preferences to the extent necessary to create a "dominant design" suitable for the mass market.[10]

This Note identifies the development of consumer preferences as a positive externality of product release, analyzes mechanisms that might be used to internalize this externality, and concludes that markets, even those resulting from radical innovations, can operate efficiently without additional regulation.

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5. *See* JOHN B. TAYLOR, ECONOMICS 412 (Bonnie Binket et al. eds., 2d ed. 1998) (defining externalities).

6. *Id.*

7. *See* Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP., Winter 1991, at 29, 29–30 (discussing technological research as a positive externality allowing incremental innovation).

8. CONSTANTINOS C. MARKIDES & PAUL A. GEROSKI, FAST SECOND: HOW SMART COMPANIES BYPASS RADICAL INNOVATION TO ENTER AND DOMINATE MARKETS 31 (2005).

9. *Id.* at 4–5.

10. *Id.* at 31.

I. Externalities and Incremental Innovation

The utility of a transaction for society as a whole is the sum of the utility for individuals. When the only parties affected by a transaction are those directly involved, the economic benefit to society can be measured by the total profits received—the sum of the benefits conferred on the buyer and seller.[11] Competitive markets maximize societal economic wellbeing by maximizing the sum of consumer and producer surplus.[12] The equilibrium quantity of a good is the point at which the marginal cost of the good is equivalent to the marginal benefit, and the demand curve and supply curve intersect.[13] When transactions occur at the equilibrium price, all consumers (except those at the margin) will purchase the good for less than its value to them and all producers (except those at the margin) will sell the product for more than their cost of production.[14] Because all parties to a transaction will profit and no nonparties will be harmed, society as a whole will benefit from every transaction that takes place.

But some transactions additionally benefit or harm third parties. These transactions create externalities—costs or benefits that spill over to parties who are not participants in the transaction.[15] In these circumstances, the marginal benefit or cost of an activity to society diverges from the sum of the marginal benefits or costs to the parties involved,[16] but in a competitive market, parties to the transaction will not consider any effect of the transaction on nonparties.[17] This lack of consideration can lead to market failures where externalities are present.

A. Negative Externalities

Negative externalities impose costs on parties who are not involved in a transaction. The cost of an activity to society then exceeds the sum of the costs to the individuals involved. For example, building a house on my property might block my neighbor's view. In this case, the full cost of

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11. *See* H. SCOTT BIERMAN & LUIS FERNANDEZ, GAME THEORY WITH ECONOMIC APPLICATIONS 83 (Denise Clinton et al. eds., 2d ed. 1998) (discussing two hypothetical situations where the parties involved consider only sum benefits between them, not externalities).

12. TAYLOR, *supra* note 5, at 186.

13. Supply–demand curves are graphed with price on the vertical axis and quantity on the horizontal axis. The curves illustrate the marginal supply and marginal demand as a function of quantity. The supply curve at quantity n shows the cost of producing the nth item. When those items are sold for a price greater than the cost of production, the difference between the sale price and the production cost for all goods sold forms the producer surplus. The demand curve can also be conceptualized as graphing the marginal benefit at a quantity, which should be equivalent to demand. *Id.* at 68–69.

14. *Id.* at 131–33, 165–66.

15. *Id.* at 412.

16. *Id.*

17. *See* BIERMAN & FERNANDEZ, *supra* note 11, at 83 (noting as part of a hypothetical that "if the . . . industry is very competitive, then the only way [a company] can stay in business in the long run is to ignore the cost of any resources for which the firm is not explicitly charged").

building my house includes not only the labor and materials but also the loss of the value my neighbor placed on his view. In determining whether to build, I consider only the amount I will spend on labor and materials.

The traditional negative externality example involves production that pollutes neighboring land,[18] but a situation more familiar to modern consumers is the consumption of network bandwidth.[19] Several services have offered music for purchase over the Internet.[20] Downloading these files causes bandwidth consumption, which potentially interferes with Internet usage by others.[21] When a user purchases and downloads a file, the price paid does not account for the potential harm that the download might cause to third parties.[22] For example, a user might pay $1 to download a song that he values at $2, but this bandwidth usage might prevent a second user from downloading a video that she values at $5. The second user successfully downloading the video maximizes total welfare. But the first user has no incentive not to maximize his individual welfare by downloading the file, so a market failure occurs. The costs imposed on third parties by the bandwidth-use negative externalities have prompted some universities to impose limits on the bandwidth that students can use.[23] Jeffrey MacKie-Mason and Hal Varian proposed a "smart market" method for network congestion control, where the price to send a packet of data on the Internet would vary based on current congestion.[24] As with network bandwidth usage, any negative externalities might cause parties to engage in a transaction in which they benefit but which, due to costs imposed on third parties, ultimately harms society as a whole.

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18. *See, e.g.*, *id.* (discussing a paper mill that pollutes a river, damaging households downstream).

19. *See* Jeffrey K. MacKie-Mason & Hal R. Varian, Pricing the Internet 1 (Feb. 10, 1994) (unpublished manuscript), http://www-personal.umich.edu/~jmm/papers/Pricing_the_Internet.pdf (describing potential for congestion on the Internet).

20. Examples include Apple Computer's iTunes and Wal-Mart's Music Downloads. J. Cam Barker, Note, *Grossly Excessive Penalties in the Battle Against Illegal File-Sharing: The Troubling Effects of Aggregating Minimum Statutory Damages for Copyright Infringement*, 83 TEXAS L. REV. 525, 531 (2004).

21. *See* Kevin Werbach, *Supercommons: Toward a Unified Theory of Wireless Communication*, 82 TEXAS L. REV. 863, 907 (2004) (noting the sensitivity of streaming video to "jitter," the excessive loss of packets in transit).

22. The situation would be different if the user's contract with the Internet Service Provider charged based on the amount of bandwidth used, but almost all users currently pay a flat fee for unlimited Internet access. Richard C. Lee, Comment, Cyber Promotions, Inc. v. America Online, Inc., 13 BERKELEY TECH. L.J. 417, 426 (1998). Even then, extreme usage might result in the Internet Service Provider increasing the cost for all users, but ordinarily, use of bandwidth harming other users can be considered a negative externality.

23. *See* H. Michael Drumm, Note, *Life After* Napster*: Will Its Successors Share Its Fate?*, 5 TEX. REV. ENT. & SPORTS L. 157, 185 (2003) (discussing bandwidth limitations imposed by universities).

24. MacKie-Mason & Varian, *supra* note 19, at 24–26.

B. Positive Externalities

By contrast, positive externalities benefit third parties to the transaction. For example, beautifying my property provides my neighbors with more attractive scenery. This causes the benefit of an activity to society to exceed the benefits to the individuals involved. The full value of my garden to society includes both its value to me and its value to my neighbors, but when determining whether I should plant a garden, I would consider only the former.

The concern associated with positive externalities is not that harmful transactions will occur but that transactions beneficial to society—but harmful to the participants—will fail to occur. For example, planting a garden that I valued at $400 might cost me $450. If my neighbor would gain $100 in value from the garden, society would be best off if I planted it. In this case, a transaction which would benefit society by $50 (total benefits – total costs) would not take place.

More complicated examples arise in the business world. When IBM developed the IBM Personal Computer (PC) in 1980, it used off-the-shelf components instead of developing the hardware and software itself.[25] Due to the open nature of this architecture, competitors were able to release computers capable of using the same peripherals, software, and accessory cards as IBM computers.[26] Rather than investing in developing their own instruction sets and hardware interfaces, these other companies exploited the earlier research investments by IBM and simply configured their products to implement the IBM PC standards.[27] IBM's release of a product with an open architecture provided benefits to its competitors for which it was not compensated.[28] Although the open architecture helped encourage widespread adoption of the IBM-compatible PC,[29] every sale of a competitor's product was a sale IBM lost.[30] Positive externalities lead to market failures in the same manner as negative externalities.[31] In this case, the societal benefit from IBM's open architecture exceeded the private benefit to IBM. The failure to reward companies for benefits conferred on competitors results in a suboptimal compensation for companies in IBM's

25. BILL GATES, NATHAN MYHRVOLD & PETER RINEARSON, THE ROAD AHEAD 52 (2d ed. 1996) [hereinafter GATES ET AL.].

26. *Id.* at 52, 54–55.

27. *Id.* at 54–56.

28. *See id.* at 56 (noting criticism of IBM for not keeping PC architecture proprietary).

29. This is an excellent example of a "network effect," where consumption of a good by one individual increases the marginal utility of the consumption of that good by others. The more consumers who buy IBM-compatible machines, the more software will be developed for the platform, so the more valuable IBM-compatible computers will be. For the importance of network effects to consumer preferences, see *infra* note 48 and accompanying text.

30. *See* GATES ET AL., *supra* note 25, at 56 (discussing competition faced by IBM due to its open architecture).

31. TAYLOR, *supra* note 5, at 415.

position, which can lead to inadequate innovation in cases in which the expected private costs of the relevant research and design exceed the expected private benefits to the innovator.[32]

C. *Incremental Innovation*

One common positive externality is contribution to incremental innovation. The development and release of one product often enables the creation of others.[33] These later products might minimally improve the first, create a second generation in the same field, or even apply the principles of the first in an entirely new field. When a product makes this type of contribution, the social value of its development cannot be determined easily. Suzanne Scotchmer writes:

> Part of the first innovation's social value is the boost it gives to later innovators, which can take at least three forms. If the second generation could not be developed without the first, then the social value of the first innovation includes the incremental social surplus provided by second generation products. If the first innovation merely reduces the cost of achieving the second innovation, then the cost reduction is part of the social surplus provided by the first innovation. And if the first innovation accelerates development of the second, but at the same cost, then its social value includes the value of getting the second innovation sooner.[34]

Even applying the proper formula, placing a precise value on the social surplus is difficult. One cannot easily measure the social surplus of a potential second generation, the cost reduction in achieving later products, or the value of accelerated development.

Technology provides the most common and well-known mechanism for incremental innovation. The research necessary to develop one product often enables the creation of others—the first product lays a technological foundation upon which later inventors can build.[35] But technological innovation is not the only way for products to contribute to future innovation.

II. Consumer Preference Development

Releasing a successful product requires both a winning product design and the technical capability to implement it. Just as earlier technological development by competitors can provide improved technological capabilities for a firm, the release of products by competitors can contribute to a firm's product design capabilities.

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32. Scotchmer, *supra* note 7, at 31.
33. *Id.*
34. *Id.*
35. *Id.* at 30; *see* TAYLOR, *supra* note 5, at 415 (discussing research as an externality).

A. Consumer Preferences Defined

Market success comes from consumers purchasing a product, and the key to successful product design is knowledge of consumers' desires. "Sellers are in the business of satisfying consumer demand . . . . Millions of dollars are spent on market research to learn just *what we want*."[36] Market research techniques used for this purpose include customer surveys and focus groups,[37] but these approaches only provide value to the extent that consumers already know what they want. In *The Road Ahead*, Bill Gates describes the difficulties encountered in designing early graphical computer applications.[38] Since these applications were among the first of their kind, fundamental questions had yet to be answered: "What should [a graphical application] look like? How should it behave?"[39] If consumers do not know or cannot articulate what they want, designing a product for them is extremely difficult.

Market research techniques seek to discover consumer preferences—any knowledge or belief by potential customers that might be useful in product design. Preferences range from broad generalities about commercialization of a particular technology—"I might use it to run short errands but it would never replace my car" or "I would rent time on a mainframe but have no interest in owning one"—to specific feedback about features in particular products—"This button is too hard to push." Preferences include not just the desires of consumers—"I want a faster computer"—but also the ability of consumers to place value on those desires—"I would pay twice as much for a computer that would boot in half the time." Another aspect of preferences is the degree of confidence in desires: Consumers can readily speculate about their potential uses for new technology, but more preferences[40] exist when consumers can articulate what they want with greater certainty and specificity. For particular product areas, consumer preferences will increase over time, even though minimal preferences might exist regarding innovative features later introduced.

Although technology companies provide the most obvious examples, consumer preferences play an important role in all innovative industries. Red Mango, a Korean company, has plans to begin selling Korean-style frozen yogurt in California beginning in April 2007.[41] The *New York Times*

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36. William J. Carney, *Defining the Corporate Constituency: Does Defining Constituencies Matter?*, 59 U. CIN. L. REV. 385, 400 (1990) (emphasis added, footnote omitted).

37. Ted Hagelin, *Valuation of Patent Licenses*, 12 TEX. INTELL. PROP. L.J. 423, 430 (2004).

38. GATES ET AL., *supra* note 25, at 59.

39. *Id.*

40. This Note uses "more preferences" synonymously with "more useful preferences" and "more developed preferences." While "I guess I might buy one" might be as much of a preference as "I would be willing to spend $50 more if it were three pounds lighter," the latter is clearly far more useful when engaged in product design.

41. Jennifer Steinhauer, *Heated Competition. Steaming Neighbors. This is Frozen Yogurt?*, N.Y. TIMES, Feb. 21, 2007, at F1.

noted Red Mango's reaction to the recent emergence of competitors in the California market: "Watching it all unfold, Red Mango executives are half frosted and half convinced that they are getting free market research, Mr. Jo said. 'We are a little annoyed but at the same time they are introducing the product category to the marketplace.'"[42] By introducing consumers to sour yogurt, Red Mango's competitors provide free market research that will allow Red Mango to tailor its product offerings more closely to consumer preferences.

B. Mechanisms of Preference Development

Developing consumer preferences requires the release of products, which not only provides information about consumer preferences—at a minimum the number of consumers willing to purchase a particular product at a particular price—but also *creates* consumer preferences.[43] Other mechanisms, such as marketing, can also contribute to preferences.[44] When minimal preferences exist, greater exposure to a product generally causes greater preference development, but achieving the highest degree of preferences requires the highest degree of exposure by actually bringing the product home.

Real-world product use provides information unavailable from laboratory testing.[45] When Bill Gates built his home, which contains an unprecedented degree of integrated technology, he acknowledged his uncertainty about the value of the features: "The systems I'm building into the house are designed to make it easy to live in, but I won't know for sure if they're worthwhile until I move in."[46] Sometimes the only way to determine the desirability of a feature is to live with it. Only by purchasing and using a product can consumers truly understand how a particular product fits into their work and lives. When discussing the development of the VCR, Gary Hamel and C.K. Prahalad note the crucial need for gathering information by actually releasing products: "While Japanese competitors were experimenting in the marketplace, RCA was experimenting only in the lab. RCA didn't launch its consumer videoplayer until 1980. Therefore, it was

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42. *Id.*

43. What this Note refers to as "preference development," Eric Goldman describes as the transformation of preferences from "latent" to "active" when discussing preference disclosure in the context of marketing. Eric Goldman, *A Coasean Analysis of Marketing*, 2006 WIS. L. REV. 1151, 1174.

44. Professor Goldman distinguishes between preferences imposed by external forces such as marketing and preferences intrinsic to consumers. According to his formulation, "so long as satisfaction of the preference creates positive utility for the consumer, the preference's source should be irrelevant." *Id.*

45. *See* HENRY CHESBROUGH, OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY 55 (2006) (suggesting that "the most valid, most useful market research on future technologies and future market opportunities" comes from firms "selling real products to real customers, who pay with real money").

46. GATES ET AL., *supra* note 25, at 254–55.

not surprising that RCA's product, which lacked a record capability, missed the mark badly with consumers."[47] Consumers must actually attempt to integrate a product into their lives before they can determine the utility of its features.

Only product release allows consumers to gauge the value of network effects (or features relying upon network effects)—mechanisms where the value of a product increases with the number of users. For example, Microsoft's innovative Zune digital music player includes wireless networking capabilities that allow pictures and music to be shared.[48] The value of this feature to consumers will depend largely upon the culture that arises around its use. Sharing music might only occur among friends, or one could imagine a trend where strangers recognize other Zune owners and trade favorite songs. This cannot be predicted from laboratory testing or preliminary market research—Microsoft can only release the product and see how society creatively adapts to take advantage of it. Consumers might show a strong preference for this capability and make it a must-have for later players, or they might conclude that the benefits do not justify the additional cost.

When consumers' preferences develop, more data becomes available to be uncovered through traditional market-research techniques. The uncovered information can have different uses. Most obviously, the release of a product might reveal strong customer demand for an included feature. For example, the enormously successful graphical operating system of the Apple Macintosh contributed to Microsoft's development of Windows as a graphical overlay for its MS-DOS operating system.[49]

But uses for consumer preference go beyond firms incorporating successful features from competitors' products into their own. The greatest contribution to consumer preference development in an industry might come from unsuccessful products. The failure of RCA's consumer videoplayer helped reveal the importance of the record feature to consumers.[50] Some ideas seem good in the research laboratory but have unseen flaws that appear in the real world.[51] The use of some products requires a transformation of behavior that consumers are unwilling to modify.[52] By analyzing the factors

47. GARY HAMEL & C.K. PRAHALAD, COMPETING FOR THE FUTURE 48 (paperback ed. 1996).

48. Zune.net | Beam Your Beats, http://www.zune.net/en-us/meetzune/zunetozunesharing.htm.

49. GATES ET AL., *supra* note 25, at 58–59.

50. *See supra* note 47 and accompanying text.

51. *See, e.g.*, Dan Tynan, *The 25 Worst Tech Products of All Time*, PC WORLD, May 26, 2006, http://www.pcworld.com/article/id,125772-page,2-c,techindustrytrends/article.html.

52. CLAYTON M. CHRISTENSEN & MICHAEL E. RAYNOR, THE INNOVATOR'S SOLUTION 93 (2003); *see, e.g.*, Adi Gillat, *Compulsory Licensing to Regulated Licensing: Effects on the Conflict Between Innovation and Access in the Pharmaceutical Industry*, 58 FOOD & DRUG L.J. 711, 726 n.87 (2003) (mentioning the Segway Human Transporter as a potential replacement for cars as the primary instrument of transportation).

behind the market failures of competitors' products, a company can improve the design of its offerings.

C. *Measuring Preference Development*

While every product release further develops consumer preferences, the degree of development varies wildly. If a product contains largely the same combination of features as existing products, the consumer preference development might be minimal or limited to product-specific desires.[53] In contrast, products that offer innovative features or embody a new approach to commercializing a technology will create much larger development of consumer preferences.[54]

The nature of the innovative feature will also impact the degree of preference development. For some features, taking the product home is unnecessary for the creation of new preferences. When customers are generally familiar with the product, they can more successfully estimate how new features might be integrated into their current interactions. High-definition television involved significant technological advancement, but the ways in which consumers interact with the television remain largely unchanged.[55] The better picture and sound quality, although dramatic improvements, do not affect how the television is used.[56] Consumers know how to shop for televisions—they are familiar with evaluating the tradeoffs of screen resolution and size with price. By viewing a television in a store, a customer can properly judge whether the high-definition features are worth the increased cost. In contrast, personal video recorders (PVRs), such as the TiVo, offer the possibility of transforming how customers fit television into their lives.[57] Significant questions might still be asked regarding the use of PVRs: Will customers purchase one per household, one per television, or one per room? Will the PVR act as a supplement to watching live television, recording

53. Contrast the value of "I want my computer to have a graphical operating system" with "I want Microsoft Word to open documents in Print Layout instead of Normal Layout." Both statements have some value for all companies, but the former provides greater contribution to the product design of all companies.

54. *See, e.g.*, GATES ET AL., *supra* note 25, at 58 (discussing the novelty and usefulness of a graphical operating system).

55. *See* Thomas S. Fletcher, Note, American Library Ass'n v. FCC*: Charting the Future of Content Protection for Digital Television*, 21 BERKELEY TECH. L.J. 613, 614 (2006) (discussing digital television).

56. Daniel Patrick Graham, *Public Interest Regulation in the Digital Age*, 11 COMMLAW CONSPECTUS 97, 114 (2003).

57. *See* Daniel E. Abrams, Comment, *Personal Video Recorders, Emerging Technology and the Threat to Antiquate the Fair Use Doctrine*, 15 ALB. L.J. SCI. & TECH. 127, 131–32, 137–39, 148 (2004) (discussing the potential for large-scale "time-shifting," which would cause television broadcast schedules to become largely irrelevant).

shows only when they would otherwise be missed, or will the PVR completely end the watching of live television?[58]

Consumer preferences are used in incremental innovation, so even if the development of preferences could be accurately measured, their value to society would still be difficult to determine.[59] The preferences developed from the release of any particular product are not *necessary* to create a subsequent product. The inspiration to include or exclude particular features might strike an innovator whether or not preferences are well known. Consumer preference development simply speeds the release of products corresponding closely to consumer desires. The societal value of preference development would then be the amount society benefits by having better subsequent products available sooner.[60]

While general qualitative comparisons can be made between the degree of preference development that occurs with different products, quantifying the degree of preferences that exists and the amount of development that occurs is extremely difficult. Clearly, (1) these preferences exist, (2) the amount of preferences varies by market, and (3) products contribute to the development of preferences in different amounts, but no precise values can be placed on them.[61] Although measuring their effect is difficult, consumer preferences play an important role in product design.

D. Preference Development as a Positive Externality

Although consumer preferences have been widely recognized in scholarly literature,[62] particularly in business texts,[63] the development of consumer preferences due to product release has not been noted as a positive externality. Because competitors also gain when a product is released, the marginal benefit to society from the sale of a product exceeds the sum of the participants' marginal benefits; the market failure dangers associated with positive externalities will thus be present. For example, an individual might value a particular product at $100. If the product was sold for $105, then this person would not purchase it. But if the purchase also caused $10 worth of development of consumer preferences to take place, society overall would

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58. *See id.* at 148 (discussing how if time-shifting took hold, it would be irrelevant when broadcasters aired programs).

59. Scotchmer, *supra* note 7, at 31.

60. *Id.*

61. One could imagine a system designed to try to quantify these preferences. It might be based on repeated surveys asking consumers to identify desired features, degree of confidence in the desire, and degree of importance of the feature. This might serve to measure the state of the preferences at a given point in time, but since the development of preferences due to a single product occurs over time, attributing any changes in consumer preferences to a particular product would prove difficult at best.

62. *E.g.*, Daphna Lewinsohn-Zamir, *Consumer Preferences, Citizen Preferences, and the Provision of Public Goods*, 108 YALE L.J. 377 (1998); Daniel D. Polsby, *Should Government Attempt to Influence Consumer Preference?*, 23 HARV. J.L. & PUB. POL'Y 197 (1999).

63. *E.g.*, MARKIDES & GEROSKI, *supra* note 8.

benefit from the transaction occurring. Recognizing consumer preference development as a positive externality of product release allows for the traditional analysis of externalities to be applied and suggests mechanisms that could be used to mitigate potential market failures.

III. Radically Innovative Markets

Although most markets have stabilized and include well-developed consumer preferences, some markets operate differently because they lack preferences. Paul Markides and Constantine Geroski describe "radically innovative markets" as occurring when a new technology emerges, causing a major change in consumer habits and destroying the value of existing companies' competencies and complementary assets.[64]

A. Definition

Traditional product development operates through demand–pull mechanisms—companies create products to meet identified customer needs.[65] By contrast, radically innovative markets result from supply–push mechanisms—research leads to new technology, which companies are then formed to commercialize.[66] This new technology provides capabilities that were previously unavailable but do not directly meet a consumer demand.[67]

Some technologies will inevitably be commercialized following discovery, but in the early stages of the markets, it is unclear how this will occur and what form the commercialization will take.[68] Imagine that a discovery allows the relatively inexpensive production of holograms. The potential uses for this technology would be countless. Holograms might become a key component of high tech courtrooms.[69] They might replace or supplement email as a communications medium.[70] Holographic doctors

64. *Id.* at 4.

65. *Id.* at 21; *see* CHRISTENSEN & RAYNOR, *supra* note 52, at 34 (defining "sustaining innovations" normally made by established companies as incremental improvements to improve product quality).

66. MARKIDES & GEROSKI, *supra* note 8, at 24–26.

67. *Id.*; *see* CHRISTENSEN & RAYNOR, *supra* note 52, at 103 (describing the early challenge in emerging markets as "competing against nonconsumption").

68. MARKIDES & GEROSKI, *supra* note 8, at 24–25.

69. *See* Susan Nauss Exon, *The Internet Meets Obi-Wan Kenobi in the Court of Next Resort*, 8 B.U. J. SCI. & TECH. L. 1, 15–17 (2002) (discussing the potential use of holograms in a "cybercourt"); Susan Nauss Exon, *A New* Shoe *Is Needed to Walk Through Cyberspace Jurisdiction*, 11 ALB. L.J. SCI. & TECH. 1, 53 (2000) (same).

70. *See* James Bopp, Jr. & Daniel Avila, *Perspectives on* Cruzan*: The Sirens' Lure of Invented Consent: A Critique of Autonomy-Based Surrogate Decisionmaking for Legally-Incapacitated Older Persons*, 42 HASTINGS L.J. 779, 790 (1991) (noting the use of holographic messages in the film *Star Wars* and speculating on the role that holograms might play in surrogate decisionmaking to proponents of the invented consent theory).

might take over medical treatment.[71] Even if these possibilities failed to materialize, there can be little doubt that, given the technology, some form of hologram would find its way into a successful commercial product. But despite these myriad uses, during the course of their daily lives, consumers simply do not think, "I wish this device made use of a hologram." Although demand would exist in the future, no demand for holograms exists at present. The commercialization of hologram technology would be supply–push—"we have this technology, how can we make money from it?"—rather than demand–pull—"how can we build a product to satisfy what consumers want?" Companies entering radically innovative markets do more than simply respond to customer demand; these companies "lead customers where they want to go, but don't know it yet."[72]

Before a successful mass-market product can be designed, consumer preferences must be developed. Markides and Geroski refer to this as the "colonization" stage of the market.[73] Because it is unlikely that initial product offerings will correspond closely with the as yet undiscovered (and uncreated) consumer preferences, even successful products released during this stage are likely to remain niche products.[74] When consumer preferences have developed sufficiently, a company is able to release a product that matches them closely enough to become the "dominant design."[75] The release of the dominant design consolidates the market, transforming it from a niche into a mass market and dramatically increasing its size.[76] At this point, the colonization stage has ended and consumer preferences have developed to where the former radically innovative market becomes a traditional market.[77]

B. Examples

Gary Hamel and C.K. Prahalad describe how the transition from colonization to consolidation played out during the development of the VCR:

> The third hurdle was to discover what configuration of price, features, size, and software was necessary to unlock the mass market. After all, consumers had never seen a VCR before. They could hardly be relied on to provide manufacturers with precise product development specs. How much record time did consumers want? Would they pay as much as $2,500 for a machine? Was slow motion an important feature? The only way to answer those questions was to go into the

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71. *See* Susan L. Goldberg, *A Cure for What Ails? Why the Medical Advocate Is Not the Answer to Problems in the Doctor–Patient Relationship*, 1 WIDENER L. SYMP. J. 325, 338–39 (1996) (describing the holographic doctor featured on "Star Trek").

72. HAMEL & PRAHALAD, *supra* note 47, at 109.

73. MARKIDES & GEROSKI, *supra* note 8, at 9, 68–69.

74. *Id.* at 34–36.

75. *Id.* at 57.

76. *Id.* at 54.

77. *Id.* at 62.

> market again and again, each time improving the product, and coming that little bit closer to the demands of the consumer.[78]

Only after consumer preferences had sufficiently developed through repeated entries into the market could the dominant design be produced, which unlocked the mass market for VCRs.[79]

As a recent example of a dominant design emerging from a radically innovative market, Apple transformed the digital music player market with its iPod. The first digital music players, or portable mp3 players, were introduced in 1998.[80] Although they offered features previously unavailable to consumers,[81] these early players were characterized by high prices and relatively common glitches.[82] Later generations of products offered improvements,[83] but the total sales of digital music players remained fairly constant, around $100 million, for the next several years.[84] Apple entered the market in 2001 with the iPod.[85] In 2003, Apple released the third generation of the iPod[86] and a version of iTunes software that allowed Windows users to easily purchase and download digital music.[87] The iPod became tremendously popular,[88] and Apple's sales increased dramatically.[89] By 2005, Apple held seventy-five percent of a more than $4 billion market for digital music players.[90] Figure 1 illustrates Apple's sales driving the growth of the digital media player market.

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78. HAMEL & PRAHALAD, *supra* note 47, at 48.

79. Modern information technology might speed this process of collecting consumer information and incorporating it into product design. *See* BILL GATES & COLLINS HEMINGWAY, BUSINESS @ THE SPEED OF THOUGHT: USING A DIGITAL NERVOUS SYSTEM 197–99 (1999) (noting Microsoft's use of electronic customer feedback systems).

80. Eliot Van Buskirk, *Introducing the World's First MP3 Player*, CNET, Jan. 21, 2005, http://reviews.cnet.com/4520-6450_7-5622055-1.html.

81. *See* Alex Allemann, Note, *Manifestation of an AHRA Malfunction: The Uncertain Status of MP3 Under* Recording Industry Association of America v. Diamond Multimedia Systems, Inc., 79 TEXAS L. REV. 189, 199–200 (2000) (mentioning that consumers were no longer limited to playing music files on a computer or by burning onto a compact disc).

82. *Id.* at 200 n.93.

83. *Id.*

84. *See* Mintel Reports, *supra* note 1.

85. Ian Fried, *Apple's iPod Spurs Mixed Reactions*, CNET NEWS.COM, Oct. 23, 2001, http://news.com.com/Apples+iPod+spurs+mixed+reactions/2100-1040_3-274821.html.

86. Apple Computer, Inc., Identifying iPod Models, http://docs.info.apple.com/article.html?artnum=61688.

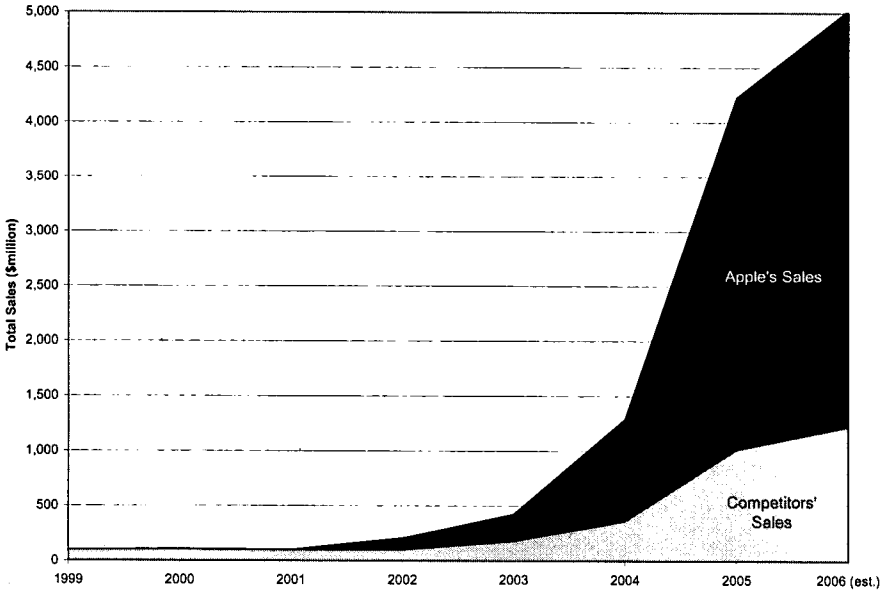
87. Press Release, Apple Computer, Inc., Apple Launches iTunes for Windows (Oct. 16, 2003), http://www.apple.com/pr/library/2003/oct/16itms.html.

88. *See* Sahana Murthy, Comment, *Public Concern—A "Newsworthy" Exception to the Grant of Preliminary Injunctions in Trade Secret Cases*, 36 GOLDEN GATE U. L. REV. 219, 219 (2006) (noting the "spectacular success" of the iPod).

89. Apple Computer Inc., Annual Report (Form 10-K), at 31 (Dec. 1, 2005), *available at* http://sec.gov/Archives/edgar/data/320193/000110465905058421/a05-20674_110k.htm.

90. *See* Mintel Reports, *supra* note 2.

Figure 1: U.S. digital music player sales[91]



The iPod became successful by correcting the flaws in earlier players through innovations such as providing better integration with computers and building a cleaner interface.[92] Apple created a dominant design, scaled up the market, and reaped large profits by using the consumer preferences developed by its competitors. Although competitors' sales increased as well, Figure 1 shows the incredible profits that accompany creating the dominant design.[93]

C. *The Role of Venture Capital*

The early entrants into radically innovative markets tend to be smaller companies, often incorporated specifically to commercialize new technology.[94] The new developments have rendered obsolete the competencies of existing companies[95] and, particularly in the early stages of

91. *Id.* at 31; Apple Computer Inc., Annual Report (Form 10-K), at 24 (Dec. 19, 2003), *available at* http://sec.gov/Archives/edgar/data/320193/000104746903041604/a2124888z10-k.htm; *see* Mintel Reports, *supra* note 1; Mintel Reports, *supra* note 2. Some data was unavailable, so U.S. iPod sales before 2005 were assumed to be 70.7% of worldwide sales (as they were in 2005).

92. LePage, *supra* note 4; *see* Allison Linn, *An Apple Milestone: 100 Million iPods Sold*, MSNBC, Apr. 9, 2007, http://www.msnbc.msn.com/id/18021581/ ("Apple has, in just a few short years, played a major role in transforming a fringe technology into a mainstream phenomenon . . . . [E]xperts credit Apple with making the technology easy enough to appeal to a mass audience.").

93. Apple Computer Inc., *supra* note 89, at 31.

94. MARKIDES & GEROSKI, *supra* note 8, at 48.

95. *Id.* at 4; *see* CLAYTON M. CHRISTENSEN, THE INNOVATOR'S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL 30–31 (1997) (discussing the failure of established companies due to disruptive technologies).

a new market, organizational impediments often prevent large companies from entering.[96] Alfred Sloan discusses the challenge of developing an air-cooled engine when General Motors previously produced only water-cooled models: "[W]e were in the situation of supporting a research position against the judgment of the division men who would in the end have to produce and sell the new car."[97]

Financing for these young companies will often come from venture capital funds.[98] Since venture capitalists offer funding to only a small number of potential investments, the investment criteria of these organizations plays a large role in determining the participants in the colonization stage, and the values of venture capital firms will greatly affect their behaviors. As well, the incentives of the decisionmakers in venture capital firms should shape the structure of these markets.

The presence of large numbers of small companies in the market at the colonization stage might benefit society by quickening the pace of innovation.[99] The different approaches to commercializing a technology help to develop consumer preferences much faster than would be possible with a single producer.[100] Each entrant brings a unique perspective to product design—a different management "frame" that dictates the type of products that might be produced and the features that might be incorporated.[101] Without the presence of competitors, a company might produce only minimally variant products, resulting in slow growth of consumer preferences and delayed emergence of a dominant design.[102]

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96. *E.g.*, ALFRED P. SLOAN, JR., MY YEARS WITH GENERAL MOTORS 89 (John McDonald & Catharine Stevens eds., 2d ed. 1990) ("[H]owever sound the engine might have been in principle, it was not my policy then or at any time afterward to force on the divisions a thing of this kind against their judgment."); *see also* CHRISTENSEN & RAYNOR, *supra* note 52, at 10 (noting that midlevel managers do not tend to support product concepts with uncertain markets). One might attribute the continuing success of Microsoft to attentiveness to new developments and market opportunities. *See* GATES ET AL., *supra* note 25, at 69 ("We have to earn our leadership position every day.... [We] ask ... 'Are we being critical enough of ourselves? Are we missing a new technology?'").

97. SLOAN, *supra* note 96, at 80.

98. *See* Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 TEXAS L. REV. 961, 974–75, 975 n.73 (2005) (describing venture capital firms as funding innovative, first-mover, start-up high-tech companies).

99. MARKIDES & GEROSKI, *supra* note 8, at 38–40.

100. *See* GATES ET AL., *supra* note 25, at 280 ("When hundreds of companies risk different approaches to discover the kinds and levels of demand, society gets to the right solutions a lot faster than it would with any form of central planning."). Analogous benefits of viewpoint diversity are found in many contexts. *See, e.g.*, David M. Peterson, Note, *Do the Swift Boat Vets Need to MoveOn? The Role of 527s in Contemporary American Democracy*, 84 TEXAS L. REV. 767, 790 (2006) (noting the importance of 527 organizations in "widen[ing] the discussion during campaigns and present[ing] the public with a variety of views").

101. MARKIDES & GEROSKI, *supra* note 8, at 57.

102. *See* Rochelle Dreyfuss, *Protecting the Public Domain of Science: Has the Time for an Experimental Use Defense Arrived?*, 46 ARIZ. L. REV. 457, 466 (2004) ("[Patentees] are free to decide that the best way to earn a reward is to block further work in their fields.").

Radically innovative markets illustrate the value of consumer preference development and its importance as an externality—producers of niche products help to create preferences that a competitor can then use to develop an enormously profitable dominant design. The contribution to consumer preferences made by an early product release might greatly exceed any profits made from the product.

IV. Mechanisms for Internalizing Externalities

Societies use a variety of approaches to attempt to alleviate the problems caused by the externality-based market failures.[103] The approaches normally seek to change incentives so that the parties to the transaction consider the effects of their behavior on others.[104]

A. Command and Control

"Command and control" solutions use government regulation to mitigate the harms associated with externalities.[105] To eliminate negative externalities arising from harm to the environment, laws might strictly limit pollution or forbid harm to endangered species.[106] Positive externalities cannot be prevented through command and control solutions, but private firms can be forced to subsidize the desired behavior.[107] It is unclear how legal requirements could be applied to the development of consumer preferences—since the benefits are unquantifiable, directly requiring their production is impossible, and compelling production of "innovative" products would be unthinkable. Mandatory disclosure requirements have become a popular tool for solving market failures caused by inadequate release of information,[108] but consumer preference information is already generally available through market research—the concern is not inadequate distribution of preference information but rather the lack of compensation for creating those preferences. Although the government possesses broad powers to compel behavior, these seem far too blunt an instrument to prevent market failures caused by the consumer preference development externality.

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103. TAYLOR, *supra* note 5, at 416.

104. *Id.* at 417.

105. *Id.* at 419.

106. *See* Jessica Owley Lippmann, *The Emergence of Exacted Conservation Easements*, 84 NEB. L. REV. 1043, 1050 (2006) (discussing the Endangered Species Act).

107. *See* Michael Klausner, *Market Failure and Community Investment: A Market-Oriented Alternative to the Community Reinvestment Act*, 143 U. PA. L. REV. 1561, 1580 (1995) (noting that the Community Reinvestment Act simply requires banks to issue loans in low-income communities, rather than attempting to internalize the positive externalities of such actions).

108. *See* Cass R. Sunstein, *Television and the Public Interest*, 88 CAL. L. REV. 499, 533–34 (2000) (noting that "compulsory disclosure of information can provide the simplest and most direct response to the relevant market failure").

B. *Taxes and Subsidies*

Taxes and subsidies provide another common solution to externality problems.[109] Transactions that produce negative externalities can be taxed, and those that produce positive externalities can be subsidized.[110] Pigovian taxes, which approximate the costs imposed by negative externalities on third parties, cause the marginal private cost of the activity to equal the marginal social cost, thus removing the market failure.[111]

Pigovian subsidies (negative Pigovian taxes), which approximate the benefits conferred on third parties, internalize positive externalities. Subsidies for consumer preference development can take on a variety of forms. The government can directly provide funds to producers, thus reducing the costs of production and increasing supply. Rebates can be given to consumers who purchase goods, thus increasing demand. Alternatively, the same can be accomplished through tax breaks for companies engaged in radical innovation or for purchasers of these products. While these subsidies would certainly encourage entry into radically innovative markets, subsidies that insufficiently correspond to the amount of the benefit conferred on third parties will result in greater overall inefficiency.[112] For this externality, the two most obvious approaches—a flat subsidy for product release and a subsidy based on sales—bear little relationship to the development of consumer preferences that takes place. The extreme difficulty of quantifying consumer preference development suggests that any subsidy would only cause additional inefficiency.

C. *Private Remedies*

Private remedies, perhaps the most obvious regulatory candidate, seek to harness market forces in solving the consumer preference development externality.[113] The Coase theorem suggests that with well-defined property rights and minimal transaction costs, efficient outcomes will result.[114] Under these circumstances, third parties affected by externalities can negotiate with the parties to the transaction to reach an efficient result—the initial assignment of the rights is unimportant.[115]

This suggests that private transactions could remedy any inefficiencies caused by the consumer preference development externality. A company

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109. TAYLOR, *supra* note 5, at 421.

110. *Id.*

111. Alex Stein, *Of Two Wrongs That Make a Right: Two Paradoxes of the Evidence Law and Their Combined Economic Justification*, 79 TEXAS L. REV. 1199, 1213–14 (2001) (describing the application of Pigovian principles to a tax on personal injury cases).

112. Henry E. Smith, *Ambiguous Quality Changes from Taxes and Legal Rules*, 67 U. CHI. L. REV. 647, 697–701 (2000) (discussing the difficulties in efficient use of subsidies).

113. *See* TAYLOR, *supra* note 5, at 417.

114. *Id.* at 418–19; *see* Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 8 (1960).

115. TAYLOR, *supra* note 5, at 417–18.

considering the creation of an innovative new product could, after the signing of numerous ironclad nondisclosure agreements, simply describe the product to its potential competitors and bargain with them for compensation in exchange for the benefits that they would receive through the increased consumer preferences.

The Coase theorem breaks down in this circumstance for two reasons. First, the transaction costs in such an arrangement would be far from minimal. Companies would have to consider the risks (and potential costs of litigation) of competitors violating nondisclosure agreements. Few businesses seem particularly interested in demonstrating their newest and most innovative products to the competition, and if consumer preferences cannot be quantified, negotiating the appropriate compensation might prove problematic.

In addition to transaction cost issues, a "free rider" problem[116] is associated with public goods, which possess the attributes of nonrivalry in consumption and nonexcludability.[117] Consumer preferences are nonrivalrous in consumption because use of the preferences by one company does not prevent use by another. Multiple firms can simultaneously develop products using the consumer preferences resulting from the release of an earlier product. Consumer preferences are also nonexcludable: competitors cannot be prevented from using market-research techniques to investigate new preferences.[118] The creators of public goods must be wary of "free riders," who might benefit from goods without paying for them. In this case, some competitors would refuse to pay the product developer, confident that the product would be released regardless and that they could not then be prevented from making use of the additional consumer preferences generated by the release.[119]

One might look to intellectual property law for a potential solution to the free rider problem. Although "[i]nformation is a public good,"[120] intellectual property laws create excludability for certain unauthorized uses

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116. *Id.* at 419; *see also* Keith N. Hylton, *Efficiency and Labor Law*, 87 NW. U. L. REV. 471, 478 (1993) (hypothesizing that unions help solve the "free rider" problem associated with providing "public goods" in the workplace).

117. TAYLOR, *supra* note 5, at 406–07.

118. One could imagine circumstances in which this would not be the case: a firm might require that customers sign nondisclosure agreements preventing them from discussing their impressions of the product. Aside from the obvious unworkability of such agreements, the lost sales due to customers refusing to sign the agreements and the harms to advertising would seem to outweigh any benefits of denying this information to consumers. But consider the use of "beta" releases of software products, designed to allow a company to improve a product in response to market feedback before its widespread release. The purpose of nondisclosure agreements in beta releases seems more directed at preventing preliminary review of the product (which might reduce subsequent "buzz" at release) than on preventing competitors from using the increased preferences for their own product design.

119. *See* TAYLOR, *supra* note 5, at 407, 419 (discussing free rider problems).

120. Sunstein, *supra* note 108, at 516.

of information by establishing legal penalties.[121] The lighthouse is a classic example of a public good, possessing both nonrivalry and nonexcludability.[122] Excludability could, however, be created by a legal requirement that no ship could use a lighthouse without the permission of its owner. Enforcement would then require oversight of every ship passing through the area to determine which ships look at the lighthouse and which do not.[123] Although the enforcement costs would greatly exceed the benefits, the light from a lighthouse could be made excludable through government action.[124]

Legally establishing excludability for the use of consumer preferences would be quite problematic. Each potentially infringed patent can be measured by its claims,[125] but consumer preferences blend together in a pool of common knowledge. To make use of consumer preferences when engaging in product design would mean using, to some degree, the preferences created by every previous entrant into the market. Even the dominant design's inventor might be unaware of which previous products inspired him to include or exclude particular features. Additionally, no relationship exists between the commercial success of a product and the preference development that occurs. Together, these suggest that a consumer preferences analogue to intellectual property would be unworkable. The most extreme form this might take would be allowing the producer of a good to prevent future entry into the market, at least for a limited period. In addition to greatly slowing the pace of innovation in radically innovative markets, this would also dramatically overincentivize early entry into a market.

Due to the immeasurability of consumer preference development, traditional solutions designed to internalize externalities are unavailable. Any system that attempted to quantify the contribution made to preference

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121. SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 34 (2004). In addition, consider that designing products to prevent reverse engineering also attempts to create excludability in the technology used in the product.

122. TAYLOR, *supra* note 5, at 408.

123. Given the current costs of intellectual property litigation, rigorous inspection of every ship coupled with long arguments about whether the pilot actually glanced at the lighthouse seems an appropriate analogy. LeRoy L. Kondo, *Untangling the Tangled Web: Federal Court Reform Through Specialization for Internet Law and Other High Technology Cases*, 2002 UCLA J.L. & TECH. 1, 66 ("Since intellectual property litigation costs—often measured in the millions of dollars—typically rank among the highest in corporate law, economy is considered lacking in this area of law.").

124. This suggests that one might differentiate between "voluntary" public goods, from which individuals can choose to exclude themselves—such as information or light from a lighthouse—and "involuntary" public goods, from which every individual must benefit—such as clean air or national defense. Through state action, every voluntary public good could be made excludable through prohibitions on and monitoring of its consumption, although the enforcement costs of such prohibitions might often outweigh any efficiency gained by doing so.

125. *See* Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1352 (Fed. Cir. 2005) (invalidating a patent for failure to clearly demark the scope of the claimed invention).

development by individual products would be extremely costly and likely unworkable.

V. Implications of the Inability to Internalize the Consumer Preference Development Externality

A. Traditional Markets

Although uncompensated consumer preference development occurs in traditional markets, there is little cause for concern. These markets already contain well-developed consumer preferences; only minimal additional development results from each new product release.[126] The value of this increase in consumer preferences is insignificant compared to the profits that the producer expects to earn through sales,[127] so even a perfect internalization of the consumer preference development externality would likely cause only minor changes in behavior and provide essentially insignificant extra incentives for product development. As well as the expense and difficulty of a system to reward preference development, the high transaction costs would far outweigh the compensation for preferences in traditional markets. While the consumer preference externality exists in traditional markets, it has only a minimal effect, and any attempt to internalize it would likely create inefficiency.

B. Radically Innovative Markets

1. Early Entry into Radically Innovative Markets.—The inability to internalize the consumer preference development externality becomes most important in radically innovative markets, where these preferences are extremely valuable during market colonization. Without some reward for the generation of information that allows a dominant design to be produced, one would expect a less than optimal number of companies to enter these markets at the colonization stage, thus slowing the pace of innovation.

Advice given to potential entrants of radically innovative markets corresponds to these expectations. Geroski and Markides bluntly predict a dismal fate for the majority of companies attempting to enter the market early: "Most of the new entrants do not last long."[128] They advise large corporations to enter radically innovative markets as "fast second" movers and suggest that much early entry is due to an overestimation of first mover

126. *See* CHRISTENSEN & RAYNOR, *supra* note 52, at 32 (arguing that in traditional markets, "the race entails making better products that can be sold for more money"); HAMEL & PRAHALAD, *supra* note 47, at 33 (noting that in existing markets, the "rules of competition" have already been written).

127. And, additionally, it is insignificant compared to the costs of product development.

128. MARKIDES & GEROSKI, *supra* note 8, at 50.

advantages.[129] Gary Hamel and C.K. Prahalad advise that, "[T]he goal is not to be first in any absolute sense . . . but to be first with the product that finally—because of its ideal blend of price and performance—unlocks the emerging mega-market."[130]

Despite the lack of compensation for consumer preference development, there seems to be no lack of companies entering radically innovative markets. Indeed, Markides and Geroski describe "an avalanche" of entrants in the early stages.[131] Although determining the optimal level of innovation is difficult, and thus suboptimal innovation could be occurring, the large number of entrants suggests that significant incentives for entry exist.

2. Cognitive Biases in Participants.—When investigating this discrepancy, the incentives of two groups must be examined: (1) entrepreneurs forming companies to enter radically innovative markets and (2) venture capitalists funding such companies.

Entrepreneurs forming companies in radically innovative markets likely possess natural overconfidence and optimism.[132] Bill Gates wrote, "To win big, sometimes you have to take big risks."[133] Part of the overconfidence in entrepreneurs might result from the need to take action in the midst of uncertainty.[134] If the potential founder of a start-up company waited until the success of the business was assured, the opportunity the founder sought to exploit might have disappeared.[135] Not only must an entrepreneur commit himself personally in beginning his venture, but he must also convince others—such as employees or venture capitalists—that the idea will succeed.[136] Leslie Palich and Ray Bagby suggest that entrepreneurs might not be any more risk-seeking than the rest of the population but instead are simply more inclined to view a situation in a positive light.[137] Thus, those considering entry into a radically innovative market would be inclined to overestimate their chances of succeeding and creating the dominant design.

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129. *Id.* at 44, 119–20. *But see* CHRISTENSEN, *supra* note 95, at xx ("There is strong evidence showing that companies entering these emerging markets early have significant first-mover advantages . . . .").

130. HAMEL & PRAHALAD, *supra* note 47, at 197–98.

131. MARKIDES & GEROSKI, *supra* note 8, at 42.

132. *See* Lowell W. Busenitz & Jay B. Barney, *Differences Between Entrepreneurs and Managers in Large Organizations: Biases and Heuristics in Strategic Decision-Making*, 12 J. BUS. VENTURING 9, 14 (1997) (suggesting individuals most susceptible to decisionmaking biases are most likely to become entrepreneurs). Early entry into radically innovative markets may also provide entrepreneurs with psychic (non-economic) benefits, such as pride and prestige for working on cutting-edge technology.

133. GATES & HEMINGWAY, *supra* note 79, at 262.

134. Busenitz & Barney, *supra* note 132, at 15.

135. *Id.*

136. *Id.*

137. Leslie E. Palich & D. Ray Bagby, *Using Cognitive Theory to Explain Entrepreneurial Risk-Taking: Challenging Conventional Wisdom*, 10 J. BUS. VENTURING 425, 427 (1995).

Since many early entrants into radically innovative markets will be funded by venture capital, the risk attitudes of venture capital organizations will also shape the attitudes of the start-up companies. These organizations know that funding start-ups is a high-risk, high-return investment and that many of the funded start-ups will fail.[138] These investments "attract those who seek high payoffs, and who are willing to accept the correspondingly high odds against such payoffs."[139] The industry has been described as holding "a home run mentality."[140] Victor Fleischer goes further and suggests the structure of venture capital organizations might make the fund managers indifferent to losses:

> [C]onsider first the impact of losses on the venture capital professionals who manage the funds. They hold a substantial economic stake in the funds they manage, but only on the upside. In a typical partnership agreement with LP investors, the venture capital professionals contribute just 1% of the capital to the fund but receive a carried interest of 20%—they receive 20% of the profits of the entire fund despite only putting up a small amount of money. The carry gives the venture capitalists a large share of the upside potential but almost none of the downside.[141]

With such a focus on the big win, venture capitalists might prefer keeping the potential upside as large as possible and not be particularly concerned with the degree of loss that occurs in those ventures that inevitably fail or limp along.

The combination of optimism bias of entrepreneurs and risk-seeking bias of venture capitalists will shape the practical incentives in radically innovative markets.

3. Effects of Risk-Seeking and Optimism Biases.—Perfect internalization of the consumer preference development externality would transfer some profit from later products—and most importantly, from the dominant design—to the earlier entrants in the market. Some profits from the dominant design would be redistributed to other companies in proportion to their contribution to consumer preferences. This would significantly reduce the profit in creating the dominant design but would only slightly—compared to the value of the dominant design—increase profits or reduce losses of other companies.

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138. Joseph Bankman, *The Structure of Silicon Valley Start-Ups*, 41 UCLA L. REV. 1737, 1765 (1994); *see* CHRISTENSEN & RAYNOR, *supra* note 52, at 8 (mentioning an industry maxim that out of every ten investments, two will fail, six will barely survive, and two will "hit the home runs on which the success of the entire portfolio turns").

139. Bankman, *supra* note 138, at 1765.

140. *Id.* at 1764 (quoting an unnamed "prominent venture capitalist").

141. Victor Fleischer, *The Rational Exuberance of Structuring Venture Capital Start-Ups*, 57 TAX L. REV. 137, 151–52 (2003) (footnote omitted).

Both entrepreneurs and venture capitalists likely prefer the current system even to an ideal system for internalizing the externality. Venture capitalists are risk-seeking: given the choice between $1 and a $1/n$ chance of $\$n$, the venture capitalist would roll the dice. Rather than losing slightly less on unsuccessful companies, they would prefer to keep the big win (with the dominant design) as large as possible. Entrepreneurs, on the other hand, would tend to overestimate their chances of creating the dominant design and underestimate their chances of failure. No one enters a market planning to go bankrupt. The prospect of transferring money away from the company creating the dominant design—which all start-ups envision themselves becoming—to its competitors would not motivate entrepreneurs. In effect, radically innovative markets in the colonization stage act as a lottery with the dominant design as a jackpot; entrepreneurs overestimate their odds of winning, and venture capitalists' incentive structures simply encourage gambling.

One well-known method for encouraging the development of intellectual property is the use of prizes—rewards offered for specific achievements.[142] Many prizes offer a fixed fee for the achievement of some objective but require that the solution be placed in the public domain.[143] Because the market size and potential profits scale up dramatically when the dominant design emerges, the possibility of achieving the dominant design effectively acts as a prize during the colonization stage of the market. Instead of focusing on all possible outcomes for their company, participants in radically innovative markets just hope to earn the dominant design prize and unlock the mass market with their products.

The nature of radically innovative markets ensures that many early entrants will be start-up companies whose participants possess some degree of optimism bias or risk-seeking in their decision-making. Although these early entrants are uncompensated for the development of consumer preferences that results from their actions, the optimism bias and risk-seeking provide sufficient incentives to enter radically innovative markets in the colonization stage because of an overestimation of the size of the profits and likelihood of gaining the profits resulting from creating the dominant design.

VI. Conclusion

In addition to the well-known role that technological innovation plays in incremental innovation, the release of a product creates the positive externality of further developing consumer preferences, which aid in the design of later products. While this effect always occurs, it can be seen most clearly in radically innovative markets, in which little to no consumer preferences exist. Although it would seem that not rewarding companies for

142. SCOTCHMER, *supra* note 121, at 41.

143. *Id.* at 42.

helping refine these preferences would lead to insufficient incentives for the release of innovative products, the risk-seeking in radically innovative markets allows the current prize system to provide greater incentives for innovation than would formalized internalization. In traditional markets, the small amount and value of additional consumer information created by product release would be far outweighed by significant transaction costs and inefficiencies in a system of formalized protection. Therefore, markets can function efficiently despite the existence of this externality and no regulation is necessary to counteract its effects.

—William R. Peterson

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