INTRODUCTION

The Invisible Infrastructure of Innovation

Intellectual property (IP) is the invisible infrastructure of innovation. Intellectual property rights are a source of hidden wealth worth trillions of dollars, and they impose hidden costs on the same scale. The rules of intellectual property range from confusing to nearly incomprehensible, and the professional practitioners who manage these rights sometimes seem to belong to a secret society. Many of those who use the intellectual property system, or oppose it, have hidden agendas. This book reveals those secrets, and helps readers grasp how the system works and how they can make it work for them.

Tensions about intellectual property are no surprise. Fights over intellectual property issues are increasingly tumbling out of obscurity and into public view on the global stage, in international organizations, national legislatures, boardrooms, and courtrooms.

- Pharmaceutical companies promote stronger patents to stimulate innovation, while patient advocates around the world seek greater access to patented drugs.
- Tropical nations demand that anyone who removes biological materials must ask permission and pay for the privilege, while researchers from the north complain that the "greenhouse door" is being slammed closed.
- The Canadian makers of the ubiquitous Blackberry device claim they were "bullied" into a $600M settlement by NTP, a small U.S. company with no products on the market. With its new wealth, NTP takes on Palm and others.
- The United States pushes China to stop the rampant piracy of software and movies, while others debate whether stronger enforcement of copyright in developing countries only benefits foreign businesses.
- Multinational media publishers promote tighter control over distribution of music and video works on the Internet, while open source software and open access science thrive.

Intellectual property surrounds us. You may be standing in a bookstore, or sitting with this book at home, in your office, in a library, or a classroom. Or you may be reading an excerpt on a computer screen, accessed through the Internet. Intellectual property helped give you these options. For example, the computer embodies decades of continuous innovation. Invisible and hidden within the computer are countless intellectual property rights that serve as the infrastructure of that innovation. The monitor, the hard drive, the keyboard, the printer, and the cabling each are the subject of numerous patents on electronic circuits, materials, and mechanical structures. The software programs used to write this book, edit it, and print it,

and make it readable on a computer screen, embody layers of copyrights as well as trade secrets. Different vendors have branded the computer and its components with trademarks (e.g., DELL, INTEL, and SEAGATE). The hardware may be built in Korea, and the software may have been written in India.

Once you start to pay attention, you see that the same invisible infrastructure exists in the clothes you wear, the medicine you take, the books and entertainment you enjoy, your car, your home, the food you eat, and the energy you consume.[1] In the blood coursing through your veins, patented medicines may protect you from diseases.

Nutrients from breakfast also circulate in your blood – perhaps the residue of branded products sold internationally, like CHEERIOS® cereal, DUNKIN'® donuts, and STARBUCKS® coffee, or bread from a bakery known locally. Your clothes, too, bear trademarks – perhaps ARMANI®, if you are wealthy, or a less expensive brand sold at WALMART®, – and could have been made by complex computer-driven textile equipment having patented machinery and copyright protected software, or by poor laborers in developing countries using designs created in Europe or the United States.

The newspaper you read this morning (in print or on line) probably included reports about war, with its advanced destructive military technologies, and features about the latest sports results, blockbuster movie, and hit song. There may be stories about a new drug, the ongoing disputes between rich and poor countries about world trade and the balance of power, and public budgets for scientific research and the arts. Advertisements for electronic devices, foods, beverages, and clothing abound. All of this is driven by the forces of innovation and intellectual property.

How did intellectual property – in the modern form of patents, copyrights, trade secrets, and trademarks – arise? How did these rights flow together into the computer on your desk, and into, on, and around your own body? What role does intellectual property play in driving engineers, scientists, and creative talent to generate such remarkable innovations? How does intellectual property serve as a social force that drives and nurtures creativity, or blocks its benefits, in so many spheres?

Intellectual property remains a "black art," understood by few while influencing many. To shed light on that dark topic, this book provides a dynamic view of intellectual property – how it arises, grows, and flows, how it shapes global society, and how society shapes it over time. This book is directed to people who want to learn how intellectual property shapes our world, to understand the controversies over intellectual property, and more importantly to use their knowledge to help them meet their own goals.

All of us – creative individuals, inventors, authors, business people, and curious people everywhere, in corporations, academia, nongovernmental organizations, and government agencies, in rich and poor countries – can learn the fundamental concepts, dynamics, and strategies of intellectual property. We can apply this

[1] "Intellectual Property in Everyday Life – A Virtual Tour" (World Intellectual Property Organization 1999), available at http://www.wipo.int/about-ip/en/athome.htm, accessed December 31, 2006.

understanding to find new meaning in our surroundings, and new strategies that will best help us achieve our goals.

NEED FOR A SHARED FRAMEWORK

Globalization, innovation, and good leadership are universally recognized as driving forces in society, given the accelerating pace of technological change; the rise of a "knowledge economy;" the tightening interdependence of markets, technology, and culture; and the growing disparity between global haves and have-nots. It should be self-evident that intellectual property is a key to understanding the dynamics of global innovation, but it has not received the comprehensive attention it deserves.

Most books about intellectual property are written narrowly for a specialized audience. These include legal treatises, textbooks, and policy books typically opposing intellectual property rights and advocating change. Business management books on intellectual property generally focus on the benefits of IP management for U.S. industries, not its larger role in the global economy and public institutions.

The lack of broad attention to intellectual property's central role in innovation may derive from the extreme legal, economic, and technical complexity of the topic, and a lack of education about its fundamental concepts. A shared global conceptual framework would help innovators, authors, readers, and ultimately society. Business people, management experts, and lawyers could avoid costly mistakes. Economists, academics, policy makers, and lobbyists could reconsider unhelpful simplistic polarized positions opposed to or in favor of the present system, and instead present more practical suggestions. If these people could gain an understanding of the duality of intellectual property and its role in driving the innovation cycle, society would benefit, and so would they. As one critic said:

> Global accounts of recent trends in intellectual property constitute the greatest gap in the literature. The provincialism, the Americanism, of the field is deeply troubling. Almost all of the books on the subject are written for and about America. In a global information age (and book market) this makes no sense.[2]

This book begins to fill that gap by providing a brief but comprehensive account of the fundamental IP concepts and dynamics that apply broadly to all communities throughout the world – including industry, nonprofit institutions, and developing countries.

Surprisingly, despite the excruciating complexity of the field, people can quickly learn the basic tools they need to understand what intellectual property is, why it is important in their lives, and how they can use this knowledge to further their own pursuits, or just to become better informed citizens.

The audience for this book includes anyone interested in innovation, and how intellectual property encourages, channels (or stifles), and puts innovation to work. That includes innovators and people who work with innovation – lawyers, business people, academics, and policy makers, in rich and poor countries, whether or not

[2] Siva Vaidhyanathan, "Celestial Jukebox: the paradox of intellectual property," *The American Scholar* (Spring 2005), p. 131.

they have any experience with intellectual property, and regardless of their nationality and profession. It includes practitioners concerned with entrepreneurship, scientific research, technical and cultural innovation, and other creative endeavors around the world, as well as academics and policy analysts concerned with innovation and globalization. It also includes business students and business people in all industries (publishing, biotechnology, computer science, manufacturing, finance, entertainment, and service industries), and a broader range of academics, government officials, intellectual property and business lawyers, law students, nonprofit entrepreneurs, history buffs, and more.

OVERVIEW OF THEMES AND CONTENT

This book presents the big picture, focusing on fundamental concepts and practical strategies, meaning those that are relevant in three very different global communities: industry, nonprofit organizations, and developing countries. Likewise, the book emphasizes concepts and strategies that are common to all types of intellectual property – trade secrets, patents, trademarks, and copyright. These fundamentals are illustrated with a broad range of examples of how intellectual property shapes our world, drawn from personal experience, recent and older lawsuits, books, articles, and news stories. The topics are diverse, including genetic engineering, pharmaceuticals, nanotechnology, electronics, Internet distribution of entertainment and media, and the open source movement. This comprehensive (if summary) approach makes the dynamics of intellectual property more clear than is possible in books giving specialized treatment to a single topic having more narrow relevance, such as U.S. corporate business strategy, or patent law. Beginners should thus be able to grasp the dynamics of intellectual property. More knowledgeable readers can gain new skills and knowledge about the global IP system and how to work within it, or change it.

Part one introduces fundamental concepts of intellectual property, and describes the dynamics by which it has shaped our world. Chapter 1 presents a social history of innovation and highlights the prominent role of intellectual property. Since the dawn of civilization, innovation has been winding through society in a cyclical fashion, from individuals through their communities and out to society at large. Creative individuals build on past knowledge, then share and develop their creative work with others in their community, until the innovative result of the collective effort can be adopted by larger society, thus enriching the pool of available knowledge for further creative effort.

The IP system affects these three stages of the innovation cycle, and serves as an engine driving the cycle forward. First, IP laws provide incentives that strengthen the individual's will to create. Second, they define exclusive rights that permit groups to share and invest in developing the creative works of individuals within their innovative community, and to control the dissemination of those works more broadly in society. Third, IP laws limit exclusive rights so that other creative individuals and communities can access the innovation, and the innovation cycle can go forward. Intellectual property thus captures and channels and shapes innovation, linking individual inspiration with collective labor and balancing the rights of creators against the rights of others.

Chapter 2 defines the several meanings of "intellectual property." It provides a history of the rise of the modern IP system from the dawn of history, 4,000 years ago, when the Egyptian scribe Irtisen wrote about trade secrets, to the Venetian invention of patent law five hundred years ago, to the recent global proliferation of IP laws, affecting human creativity around the world.

Chapter 3 summarizes the inherent tensions in intellectual property – between exclusion and access, private rights and the public domain, monopoly and competition, freedom and oppression, and the individual and society. Advocates and opponents have debated the pros and cons of the system through the centuries, while innovation itself puts the system out of balance so that it needs continuous readjustment. These political tensions and legal and business conflicts are a worthy subject of study, practice, and reform, in private corporations and public organizations, in rich and poor countries, and will likely continue to be important, forever.

Part Two introduces the basic elements of intellectual property in organizations. Chapter 4 introduces each of the four main types of intellectual property – trade secrets, patents, copyrights, and trademarks – followed by a summary of the legal basics for each, how it is obtained, and how exclusive rights empower the owner to prevent use of the innovation. This chapter uses the metaphor of an "innovation tree" in an "innovation forest" as a framework to help understand the innovation cycle, how intellectual property harnesses individual creative labor with available resources into specific bundles of rights, and how those rights can grow, flow, and eventually become accessible to the world. The creative act is like a seed using its internal energy to sprout in a forest, absorbing external resources (air, light, water, and minerals) to grow into a sapling, then a tree. While living, the tree enriches its surroundings, producing oxygen, giving fruit, shedding leaves, and eventually dying, returning to the soil and air to provide resources for new life. The external environment symbolizes the accessible domain of knowledge from which innovation arises. The green wood of a growing tree symbolizes IP rights. The inert old growth at the heart of the tree, the falling leaves and fruit, and the tree itself when it dies, symbolize how IP rights dissipate and ultimately become accessible to others. The innovation tree metaphor helps explain the different kinds of intellectual property and how they arise from and return to the accessible public domain. The chapter explains how groups of different rights can exist in one idea, and how these can be combined in an innovation forest.

Chapter 5 describes how intellectual property assets can flow among individuals and organizations, into a larger community, and out into society, in the form of permissions, from A to B to C to D, from creator to developer to producer to customer. Owners can enforce their own rights, but must beware of infringing the rights of others. These dynamics drive individual creativity, help organizations aggregate resources into IP assets, and expand access to innovations.

Chapter 6 presents the broad range of innovation communities around the world – private, public, and mixed – and for each, provides a description of how the innovation cycle works and how the fundamentals of intellectual property apply. Chapter 7 introduces the innovation chief as a person in each innovation community who pushes innovation forward, together with teams of people who can use IP management tools wisely to cultivate, preserve, and perfect rights in intellectual property,

transfer rights successfully and ultimately help introduce innovations to society. Extending management theories about innovation, the innovation chief, working with an IP innovation manager, is described as the person who makes the decisions that lead these teams to effective (or incompetent) management of intellectual property in organizations.

Part Three, the longest section, turns to the practical steps that make up strategic management of intellectual property. Section A deals with planning. Chapter 8 shows how organizations can begin to take action, using strategic management of intellectual property to drive the innovation cycle forward and shape their environment, using practical legal and business strategies and tools. The chapter contrasts organizations that fail to take even the simplest steps to manage their IP assets from brilliant organizations. Essentially, strategic management means a process of first, understanding the organization's mission; second, assessing the internal resources and the external environment; third, developing a strategic plan by protecting internal rights while not infringing the rights of others; and finally, implementing that plan to help achieve the organization's goals.

Chapter 9 details the policy and practice tools and skills that can be used to implement an IP management strategy. Chapter 10 presents a menu of options from which organizations can choose. These are memorable strategies with colorful names like the burning stick, picket fence, patent jiu jitsu, and the cluster approach.

Section B deals with assessment. Chapter 11 describes how to assess internal resources and the external environment, including how to find the necessary information, primarily in terms of nonfinancial information. Chapter 12 focuses on financial valuation of IP rights. Examples are drawn from industry, the nonprofit sector, and developing countries.

Section C presents a systematic approach to implementing an IP management plan. Chapter 13 goes step-by-step through the decisions one should make to access innovations of others without infringing IP rights, using decision trees. Chapter 14 continues with a decision tree approach for protecting innovations with IP rights, and enforcing them. Chapter 15 surveys the many ways in which IP rights can be transferred to implement an IP management strategy.

Part Four illustrates the basic tools and practices with examples drawn from different organizations and situations. Chapter 16 describes the life sciences, communications, consumer products, and entertainment industries, and academia, comparing and contrasting the IP management strategies in each. This chapter shows people how to put intellectual property to work in their own organizations to achieve their goals, and how to analyze IP management in other organizations.

Chapter 17 compares national IP laws. Although there are many specific differences between them, the differences can be grouped into a few categories, and countries may be placed into several categories as well, making it easier for IP managers to adapt their practices to local requirements and international standards.

Chapter 18 provides a global view of the larger dynamics of intellectual property, and the tensions between different countries, regions, and industries. The dynamic concepts and strategies presented earlier in the book permit a practical new perspective on controversial topics like securitization of IP assets, balanced competition between branded and generic pharmaceutical companies around the world,

marketing of national security technology, environmentally beneficial innovation, and the ironic alliances formed by those who favor and those who oppose biotechnology. This book's approach helps readers consider their own views of what are the good, the bad, and the ugly aspects of intellectual property, and what trends to expect in the future.

The final chapter, Chapter 19, revisits the themes of the innovation cycle and the innovation forest, and the tension and balance inherent in intellectual property. The chapter concludes with reflections on how these forces are tied not just to technological and cultural wealth but also to concepts of individual and collective freedom.

Hopefully the concepts and strategies in this book can help us understand how intellectual property drives the innovation cycle in our own lives, in our communities, and worldwide. With that knowledge, we can do a better job of managing intellectual property to put creativity to work, increasing freedom, joy, and the benefits of innovation throughout society.

PART ONE

INTELLECTUAL PROPERTY DYNAMICS IN SOCIETY

1 Intellectual Property and the Innovation Cycle

This first part of the book includes three chapters about intellectual property dynamics in society. Chapter 1 begins with a description of innovation as a force of creative destruction and then provides a brief history, asking the question of why people innovate. This chapter introduces the concept of the innovation cycle, with its three stages: individual creativity, social adoption, and access to knowledge. IP laws and practices affect each stage. First, IP laws provide incentives that strengthen the individual's will to create. Second, the exclusivity that defines intellectual property rights allows groups to share and invest in developing the creative works of individuals within their innovative communities, and to control the dissemination of those works more broadly in society. Third, the exclusivity of IP rights is limited, so that creative individuals and communities can access the innovations of others, and the innovation cycle can go forward. Intellectual property thus captures and channels and shapes innovation, ideally linking individual inspiration with collective labor and balancing the rights of creators against the rights of others. The chapter concludes by noting the dark side of innovation, and limits on the role of intellectual property.

* * * * * *

INNOVATION AND CREATIVE DESTRUCTION

Innovation is a powerful force of human nature. Innovation creates new businesses, cultural movements, and social institutions, and destroys, replaces, or leaves behind the old ones. Innovation feeds on the known and converts it into the new.

Innovation helps some individuals, companies, and nations win, while others lose. Roman roads, aqueducts, and military techniques conquered the ancient world. The telegraph and the railroad opened new regions and nations to commerce, as did the Internet. The computer age made one corporation – Microsoft – an economic force larger than many nations. But Microsoft may be only a memory in future decades. Innovation has shaped history over the millennia, and changes our world every day, bringing us new creations in fields such as pharmaceuticals, biotechnology, computer software, and the music and film industries. How we innovate today, and how well, shapes our future.

Half a century ago, Joseph Schumpeter developed a theory of dynamic competition in which innovation is a "perennial gale of creative destruction" that can

open up new domestic and foreign markets, and revolutionize economic structures from within, "incessantly destroying the old one, incessantly creating a new one."[1] Schumpeter said that creative destruction is the "essential fact" about capitalism. Innovation, in this dynamic world view, is part of the destructive process, and, in a turn on Schumpter's phrase, can be referred to as a force of *destructive creativity*.

Innovation has become an ongoing concern for business managers, economists, and international policy makers. Intellectual property is one of the strongest of the tools available to stimulate and channel innovation, but the relationship of intellectual property and innovation is still poorly understood. This misunderstanding is not for lack of attention or controversy. There is more media coverage, increased emphasis in business management, and a broader and deeper international political debate about intellectual property than ever before. Controversy should come as no surprise, given the stakes, and the complexity of the task of harnessing something as paradoxical as creative destruction and the forces of destructive creativity.

What is surprising is how little has been said about the central role of intellectual property in channeling the dynamic processes of innovation. This is peculiar because the main justification for intellectual property is that it is a tool to promote innovation.

Intellectual property is a relatively new term that means different things to different people. Thousands of books and learned articles have been written about the specific legal, economic, political, and commercial details and complexities of intellectual property. This book takes a more interdisciplinary, dynamic approach by extracting fundamental concepts of intellectual property and proposing practical strategies by which these concepts can be applied in our changing world.

Lawyers, businesspeople, and our creative colleagues in science, engineering, and art can benefit from this big picture. Each of us, as individuals and as members of our communities, can learn how intellectual property shapes our world. With a heightened awareness of intellectual property basics, we can all deal with innovation more creatively and proactively. We can see how others use intellectual property as a tool to achieve their own ends, and we can do so, too.

A BRIEF HISTORY OF INNOVATION

Creativity and innovation are as old as humanity and are the most human of traits. From ancient to modern times, successful societies have been those that promote, reward, and capture individual creativity and innovation. History is written by the winners, and the individual, group, or country that innovates better than its neighbors tends to win – in business and in history. Those who fail to innovate, or to copy the innovators, are overwhelmed and replaced. Innovation holds a key to history. Modern nations will continue to compete for leadership in electronics, software, agriculture, medicine, and media. The future holds unimaginable developments in art, technology, philosophy, business models, and government institutions, and new leaders will inevitably emerge in these areas.

History can be seen as the endless story of individuals and groups creating new objects, techniques, machines, and institutions in their quest for subsistence,

[1] Joseph Schumpeter, *Capitalism, Socialism and Democracy* (Harper, 1975) [orig. pub. 1942], pp. 82–85.