

## Introduction

Information and communications technology products are indispensable tools of modern life across the globe. Smartphones and laptops connect to a vast global computing infrastructure. Sophisticated medical equipment is ubiquitous in hospitals. Robotics increasingly enable manufacturing of every kind of product. Sensor networks facilitate the flow of urban traffic. The emergence of autonomous vehicles, products enabling augmented and virtual reality, the broad array of “Internet of Things” devices, and countless other innovations suggest that these kinds of products will continue to play an ever-growing role in the modern global economy.

These products are technological marvels, comprising thousands of different technologies, developed over decades by hundreds of different companies, all working together seamlessly. In a sense, they are legal marvels as well. Their design, manufacture, and utilization take place in a legal and economic environment that is itself complex and full of hazards.

One crucial part of this environment is the global patent system. Just as smartphones include thousands of technologies, they incorporate inventions claimed in not just thousands, but tens or even hundreds of thousands of individual patents issued by patent offices across the globe. For that reason, smartphones and most other information and communications technology products can be viewed as “complex products” from a legal perspective as well – particularly when considered relative to pharmaceuticals and mechanical devices that, while equally advanced technologically, are often covered by just a handful of patents.

The reality that innovative companies now routinely bring these kinds of complex products to market in the midst of this daunting patent landscape raises a number of challenging questions with respect to how the law should value patents and provide remedies for their infringement.

For example, how should courts and, where applicable, juries calculate damages for infringement of one patent out of the thousands of (often complementary) inventions incorporated in a device? How can courts and juries tell if one feature among hundreds drove the sale of the entire product? Should patent law take into consideration that it might not be possible, let alone cost effective, for a product manufacturer in a fast-moving field to license all of the thousands of patents

embodied in its product, even prior to beginning development? Should an injunction be granted to prevent the use of a patented technology that covers a minor feature of a complex product, when the effect of the injunction would be to keep the entire product itself off the market? How (if at all) can the risks of patent holdup be reduced without generating substantial error costs or other unintended negative consequences?

Our aim in this book is to begin to address these questions systematically by setting forth both the current state of the law and an agenda for future research. We identify areas of existing consensus; build new consensus where possible; identify areas of disagreement; and specify the nature and direction of research that would be required to help resolve those disagreements. We hope that this book will assist policymakers, judges, lawyers, and others throughout the world to address these and other issues in a rational, predictable, and cost-effective manner, and that it will stimulate fruitful discussion of our recommendations and research proposals.

Before we begin that process, however, we flag for readers some important premises that underlie the analysis in this volume.

First, we take an instrumental view of the patent system. The most commonly articulated policy justifications for having a patent system are that patents provide an incentive to invest in the creation of novel, useful, and nonobvious inventions, as well as an incentive to disclose those inventions to the public so that others may learn from them, improve upon them, design around them, license them, and, once they expire, freely practice them. At the same time, patents give rise to a variety of social costs, sometimes including monopoly and other access costs, transaction costs, and administrative costs. The ideal patent system therefore would maximize the surplus of social benefits over social costs, in comparison with alternatives such as public or private funding, grants, prizes, tax credits, first-mover advantages, trade secrecy, and contract. All of these sometimes conflicting objectives are based on an instrumental view of the patent system, in which patents are justified as private rights granted in order to advance the public good. While this view is not universally accepted, it is the mainstream position, and we adopt it accordingly.

That said, we harbor no illusions that the current patent system is ideal, according to that definition, or even that the ideal system is practically attainable. Although the state of both theoretical and empirical economics continues to advance, the accurate quantification of benefits and costs with regard to any social policy often remains elusive. Given these limitations, as well as individuals' often differing value systems and the difficulty of reducing these values to any common metric, reasonable minds frequently will disagree over whether the likely effect of a proposed modification to existing patent law on balance would be beneficial or detrimental. Nevertheless, some general idea that patent rights are intended to serve the public good that comes from invention is helpful. We thus believe that, its limitations notwithstanding, the legal policy analysis that we offer here can assist policymakers in predicting whether various applications or modifications of patent

law, particularly the law of patent remedies, are likely to move toward or away from the hypothetical ideal.

Second, we take substantive (i.e., non-remedial) patent law as given. Though we acknowledge that the existing patent system is imperfect, for the purposes of this project we take substantive patent law as given, and seek to identify remedies that operate in tandem with the substantive law. For example, it is not clear whether the existing patent system provides the optimal incentive to invent. Perhaps the patent term should be shorter, or longer, or the scope of patents narrower, or broader. We do not delve into these contentious issues. Rather our approach is to consider how the law of remedies, when applied to patent law, may improve the overall patent system.

We take the view that legislatures and courts should address perceived flaws in substantive patent law by modifying it directly, not by modifying the law of remedies to mitigate substantive flaws indirectly. For example, it is not our view that courts should seek to correct for flaws in the law of patent scope by awarding minimal or nominal damages for the infringement of a patent that is valid only because the law of nonobviousness is too weak to prevent the grant of a weak patent. Granted, legislative change can be difficult to achieve in practice; and there may be cases in which correcting a problem through modulation of remedies would be the best practical solution. But there is at this point nothing approaching a consensus as to which aspects of substantive patent law are flawed, much less which of those flaws are best corrected by modifying the law of remedies.

We thus address patent remedies as a field unto itself. There are many difficult remedial issues to be addressed even taking substantive patent law as given. Our aim in this book is to make the current remedial system the best it can be. Consequently, while we do not reject this alternative approach in principle, we do not pursue it in this book.

Third, we try to balance the theoretical with the practical. In making the recommendations found in the chapters that follow, we strive to embrace the tension between optimal and realistic reforms in at least two important ways. First, we recognize that there is generally a trade-off between accuracy and administrability. For example, as more effort is devoted to improving the accuracy of damages calculations, administrative costs are likely to rise, and at some point the cost may outweigh the benefit. The law of patent remedies must negotiate various trade-offs among several important considerations, among them accuracy, predictability, administrability, and the risk of error and other unintended consequences. Second, we acknowledge that complete harmonization across the globe is unlikely. The patent laws of many nations are infused with long-standing, generally applicable legal traditions and rules that, in practice, are unlikely to change in the foreseeable future. For example, as discussed in Chapter 3, while enhanced damages are regularly awarded in the United States for willful or bad-faith infringement, most other countries have not traditionally awarded enhanced damages to any

great extent; conversely fee shifting is the default in many jurisdictions, but it is exceptional in the United States. In addition, the United States routinely uses juries to assess damages, while most other countries never do. Legal systems also differ significantly with regard to the use of expert witnesses and the extent of pretrial discovery, both of which affect the information available to fact finders assessing monetary remedies. Given these differences, what may appear to be the best practice for one legal system may not be optimal for another. Accordingly, the best practical approach to various issues may differ among jurisdictions.

Further, we recognize that complete harmonization may not be desirable even if it were possible. We cannot always confidently predict the consequences of our own recommendations, and some degree of experimentation among jurisdictions may be useful in testing what works and what does not. In our experience, courts adjudicating patent matters concerning complex products in different jurisdictions are generally aware of what their counterparts in other parts of the world are doing and at least occasionally consider alternative approaches when novel issues arise. Thus, an experimentalist approach that invites a diversity of solutions to common problems may eventually result in the adoption of optimal solutions around the world.

Our proposals therefore attempt a balance. While we will generally suggest what we believe to be the best reform, we also will provide alternatives where that first-best solution is likely not attainable.

Fourth, we do not consider extraterritorial application of national law. Though our project is international in scope, we take no position on how nations should handle infringing conduct that crosses territorial borders. A common scenario raising these concerns is when product supply chains involve more than one nation, and thus plausibly give rise to causes of action for infringement in multiple jurisdictions, as well as to the prospect that a patentee may try to enforce in one jurisdiction a remedy obtained in another jurisdiction. Yet another scenario arises when harm occurring outside a nation's territory is plausibly caused by infringing conduct that itself took place within the nation. We consider the legal issues raised in such circumstances (among them, international exhaustion, proximate causation, conflicts of law, comity principles, and international trade agreements) to be beyond the scope of this project.

Fifth, the focus of this book is on remedies for the infringement of what are generally known as "utility" patents, which cover inventions. We do not address so-called design patents, which are also known as industrial designs and design rights, and which are themselves subject to a rich body of law and ongoing debate and discussion. Nor do we cover utility models (sometimes referred to as petit patents), which are generally understood to convey protection without active examination or review by a national patent office. While we acknowledge that all of these additional patent-like rights may be implicated in complex products, along with copyrights, trade secrets, trade dress, trademarks, and the like, and it may be fruitful to pursue

a cross-border analysis of other intellectual property rights in the future, such an analysis is beyond the scope of our current project.

Finally, we note that the chapters that follow assume a degree of familiarity with theoretical concepts such as patent “holdup” and “holdout,” as well as a basic understanding of competition law. Readers who are not familiar with these concepts may wish first to skip ahead to Chapters 6 and 7 before returning to Chapter 1. Chapter 6 provides a general overview of the intersection of patent law and competition law, and Chapter 7 summarizes the academic literature on holdup and holdout. Both chapters are different from the initial five, in that they are primarily descriptive in nature and do not make normative recommendations. That said, both chapters do recommend avenues for future research.