Taking technological infrastructure seriously

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SUMMARY

This dissertation investigates the problem of access to essential intellectual property ('IP') rights in high technology, or what this thesis calls 'technological infrastructure'.

It begins by defining and defending the unique status of such infrastructure and the costs involved in its exclusive ownership, such as choking off follow-on innovation and excess private control over R&D trajectories. It then develops the argument that these outcomes can be avoided or improved upon by recruiting other innovation institutions to operate together with the IP regime, either by softening its hard edges or by channelling behavioural incentives in such a way that they converge on what this thesis argues to be the optimal rule of 'open access'. These other institutions include competition law, government R&D subsidy programs, demand-side public instruments, and business model innovation. It is the interaction between the IP system and these additional institutions, which forms the nerve of the analysis for this dissertation's investigation into access rights to technological infrastructure.

Each of the chapters in this volume analyses the interplay between the IP regime and at least one other institution. The methodology involves first clarifying the economic conditions that underwrites the interaction between the different institutions, then trying to map the drive for open access to existing or new legal rules or mechanisms, using tools from game theory and the economic analysis of the law. The second part of the methodology assesses how these legal rules or mechanisms may be implemented under the particular institutional conditions, while striking a balance between incentives to create the infrastructure and its downstream accessibility. To this end, an underlying – sometimes implicit, sometimes explicit – framework for the chapters in this volume is Neil Komesar's comparative institutional analysis, which recognises 'institutional failure' as a key component of legal analysis. Sometimes markets fail to deliver desirable outcomes. Sometimes Governments fail. Sometimes intellectual property and competition law fail too. The important issue is to identify what the objective baseline is that enables us to assess success and failure and to unpack why and under what conditions institutions fail. For the purpose of this dissertation, the normative baseline is the optimal management of technological infrastructure under an open access rule, and the various chapters then focus on how additional innovation institutions (outside of IP) can be effectively recruited to sustain this outcome.

Chapter 1, entitled 'Taking Technological Infrastructure Seriously', focuses on how the institution of competition law can modify the strategic landscape and distribution of incentives to help private companies converge on open access licensing with respect to both *de facto* and *de jure* standards. This chapter introduces an 'infrastructural approach' to the problems of

de facto and cooperative standard-setting in high technology. It reviews recent case law in the area, and attempts to provide robust economic arguments for the maintenance of 'open access' rules over such standards. First, it begins by qualifying such resources as 'technological infrastructure' according to the work of Brett Frischmann and Peter Lee. Subsequently, game theoretical tools are applied to the problem of cooperative standard-setting to demonstrate how the 'quasi-open access' FRAND commitment can constrain strategic behaviour. A legal analysis—including an examination of recent case law about the availability of injunctions—then follows to demonstrate the optimal 'negotiation framework' for the latter commitment to become credible. Finally, the infrastructural approach is expanded to demonstrate how it can elucidate a number of current controversies in high technology markets, where the tension between private ownership and public use of technological infrastructure is at its sharpest.

Chapter 2, 'Technological Infrastructure and the EU Essential Facilities Doctrine', develops in greater detail the application of the EU competition law rule of the essential facilities doctrine to *de facto* standards. As the most controversial aspect of the 'infrastructural approach' developed in chapter 1, this chapter focuses on fleshing out the legal and economic analysis with respect to technological infrastructure emerging from the market without the voluntary cooperation between companies or the granting of a FRAND commitment. The analysis digs into the details of the EU 2007 *Microsoft* case as the only EU case to date dealing explicitly with applying ex post open access rules over a privately-owned de facto technological infrastructure. The chapter also briefly considers the current EU Commission investigation into Google's open source Android Operating System, and the interesting wrinkles this adds to the analysis.

Chapter 3, 'Visible and Invisible Hands', zooms out from the competition law approach developed in the previous chapters and considers the interaction of the IP system with the institution of public (EU) R&D subsidy grants. This chapter constitutes a companion chapter to 'Taking Technological Infrastructure Seriously'; while that chapter developed the point that certain privately-provisioned knowledge assets may qualify as infrastructural assets, this chapter identifies infrastructural information assets arising in the intersection between public R&D programs and private IP rights. The nub of the argument is that information assets arising like this are unique in ways that have not been given sufficient attention in the literature: they are of sufficient social value to attract a subsidy and yet give rise to protectable inventions or creative works. Somehow each of these institutions must have failed to produce the asset, perhaps for reasons of risk or limited private appropriability. This chapter argues that the class of asset that most closely maps to these attributes is likely to be 'infrastructural'. Due to their status as infrastructure, it is argued that these R&D assets would be most

effectively managed under an open access regime, and that European subsidy programs can have a have central role in ensuring this outcome by the tweaking of subsidy grant criteria.

Chapter 4, 'Open Standards and Their Enemies', continues in the vein of the previous chapters by considering the ways legal rules may induce technological infrastructure owners to operate under an open access rule. However, this chapter considers the *demand-side* institution of Government public procurement policies. It argues that public procurement policies that demand zero-fee or royalty-free patent licensing over standards may backfire by insufficiently considering the strategic landscape of the standard-setting process. The chapter suggests that the rise of the pure-play IP licensing company in the information technology market place may be incompatible with a royalty-free standards policy, as it drastically lowers their incentives to engage in formal standard-setting and the attendant licensing obligations. By limiting such companies' ability to derive revenue from participating in SSOs, open standards policies may (with the best intentions) result in standards being less open, as pure-play IP companies assert their patents after the adoption of the standard- thus shutting down access and jeopardising the standard ex post.

Chapter 5, entitled 'Intel, ARM and Private Ordering Approaches to Technological Infrastructure' considers the institutions of IP management and business model innovation as ways of managing technological infrastructure. It reviews how and why private companies often have incentives to engage in open access licensing even without the threat of competition law enforcement. Its focus is the fascinating market of CPUs that power the swathe of 'embedded devices' from smartphones to the nascent Internet of Things ('IoT'), and in particular, the approach to intellectual property licensing of the two main contenders there, ARM and Intel. These two companies are both deploying significant resources to become the *de facto* CPU standard and technological infrastructure for both the smartphone market and IoT devices. The companies have very different approaches to managing their IP, which this chapter argues may be a determinative feature in their battle to develop the emerging technological infrastructure. While ARM licenses its IP freely to downstream chip makers, Intel is extremely restrictive of who it licenses its IP to and generally attempts to be the only downstream supplier of its CPU architectures. These differences in IP licensing strategies are also replicated in the software space, where the openness or closedness of selected operating systems may serve to reinforce or undercut the drive towards de facto standardisation of the CPU. This chapter analyses the salient differences in these two broad strategies to IP licensing, and attempts to distil some predictions about how these different approaches will drive the process of technological infrastructure standardisation- in both hardware and software- for the emerging post-PC marketplace. The conclusions shed light on the use of business model innovation as a method for both managing and leveraging the success of technological infrastructure

The five chapters illustrate the many complexities and nuances in the debate over private rights over information technology infrastructure in its various guises, taking into account market conditions, legal rules, and private ordering. All these many guises serve to demonstrate that there is no silver bullet, that there are no one-size-fits-all solutions to openness in information technology markets, but that taking technological infrastructure seriously is a good place to start.