The Long Wait for Innovation:

The Global Patent Pendency Problem

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CENTER FOR THE PROTECTION
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EXECUTIVE SUMMARY

One of the biggest problems with the global patent system has been largely overlooked and under-examined. While fierce debates have raged about patentable subject matter and exceptions to patent rights, a bigger problem has been quietly rendering such issues relatively moot in some countries:

In short, it takes a very long time to get a patent in many countries.
So long that patents approach irrelevance for some industries in certain countries.

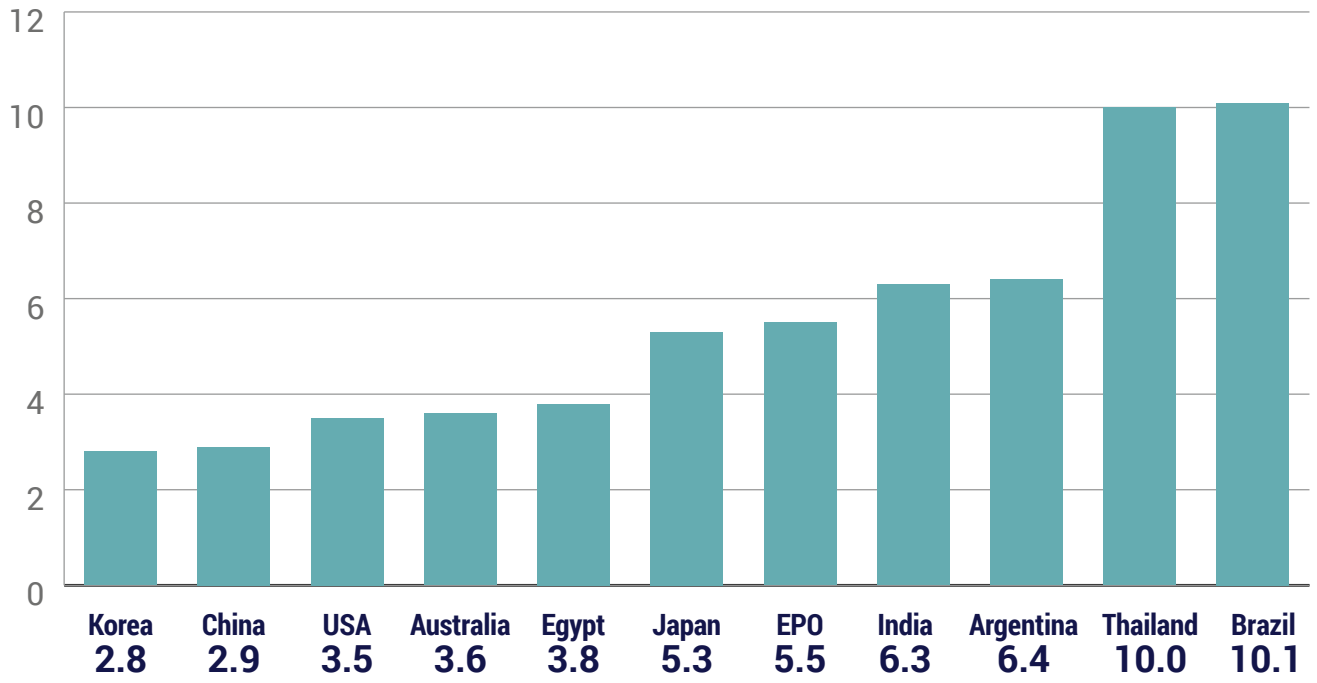
Over the last decade, innovators have filed an increasing number of applications in patent offices around the world. Many of these patent offices are not coping well at all.

In some countries, the average time to grant from application now stands at 10 years or more. In some industries, the average is even higher. For example, in Thailand, the average pharmaceutical patent granted in 2015 was 16 years old. In Brazil, patents in mobile technology fields are averaging more than 14 years old.

FIGURE 1 summarizes the problem:

These results call out for a solution, especially since the problem could easily get worse in coming years as many patent offices apparently have yet to process applications from recent years, when huge increases in applications have occurred. Fortunately, many of the solutions to the problem are relatively straightforward. They require the application of sufficient resources and a willingness to allocate the burden by hiring an appropriate number of examiners and sharing work between patent offices. It's largely a matter of political will and good governance rather than complex policy.

FIGURE 1 Average Granted Application Age for Selected Countries 2008-2015 (in years)



Global Overview of Patent Pendency

For the first part of our study, we investigated the time it takes to have a patent granted in long established and relatively efficient patent offices such as the US, China and Korea, and in developing patent systems such as India, Brazil, Argentina and Thailand. Rounding out our survey with Australia, Egypt and the European Patent Office, we found average pendency periods that ranged from 2.8 years in Korea, to 10 and 10.1 years in Thailand and Brazil, respectively.

While every country experiences unique problems related to backlog and pendency, we were able to identify certain trends and draw the following insights into global patent delay:

- **Neither national wealth, nor relative lack of it, determines how quickly a country's patent office can process applications.** While the U.S is the wealthiest country in our sample, its 3.5 year pendency average is not quite the quickest. Moreover, Japan and the European Patent Office(EPO), despite relative wealth, rank towards the middle of our sample at 5.3 and 5.5 years, and there is great disparity among major emerging markets such as China (2.9 years) and Brazil (10.1 years). Surprisingly, Egypt, with the second lowest GDP per capita in the sample (next to India), and a tumultuous recent history, averages 3.8 years pendency, better than Japan and the EPO, as well as India, Argentina, Thailand and Brazil.

- **It takes a really long time to get a patent in Thailand and Brazil.** On average, it takes 10 years to get a patent in Thailand and 10.1 years in Brazil. And while faster may not always be better, these extended delays are long in terms of inventors' lifespans and even longer in terms of business developments.

- **New leaders in patented innovation are emerging.** Korea and China are embracing the opportunities presented by patented innovation, showing a commitment to efficient patent processing with the fastest pendency times we found—2.8 years in Korea, and 2.9 years in China.

Global Trends by Industry

We then broke out a few important fields of technology and looked at average times to grant for each. Our review of global trends by industry regarding average patent grant times reveals three key insights:

- **The issue of lengthy pendency times for patent applications is not confined to cutting edge industries.** Slow processing appears to be an issue that is consistent across a patent office's operations, rather than confined only to "difficult" fields.

- **Lengthy pendency is an issue for both the high tech and life sciences industries.** Both mobile technology and the life sciences suffer from high average pendency periods in Brazil, Thailand, and other countries. This finding indicates a problem with resources across the board, rather than with shortages of particular types of expertise or oddities with respect to certain types of applications.

- **In many industries, some countries' average wait times render patents largely futile.** In some countries, applicants in some fields must, on average, burn through more than half the length of a patent term. Given the pace of advancement and obsolescence in some industries, much or all of the truly useful life of a patent is spent waiting for a grant. Multinational companies and other large businesses may have the resources to sustain momentum over such long waiting periods, but individuals and small and medium enterprises lack the resources and time to wait. Long wait times for patents almost certainly hurt local entrepreneurs the most.

Why Patent Delay Matters

Delays matter because patents matter. Patents affect decisions about which businesses get investments, which products get launched, whether a business gets off the ground, and other key decisions. Without the security provided by a patent, these things often simply don't happen.

Here are three ways in which patent backlog hurts a country's economy:

- **Delay Hurts Entrepreneurs.** Startups are always a risky proposition, so many business decisions are contingent upon the grant of a patent. Recent research by a scholar in this Center's Thomas Edison Innovation Fellowship, Deepak Hegde, has demonstrated this point. Hegde, along with his co-authors Joan Farre-Mensa and Alexander Ljungqvist produced a study titled "The Bright Side of Patents,"[1] which found that delays in obtaining a startup's first patent impair its performance. Every year of delay reduces the startup's employment and sales growth over the five years following its eventual approval by 21% and 28%, respectively. Delays also hurt a startup's ability to innovate, reducing the number and quality of its subsequent patents. Furthermore, for each year of delay, the startup's chances of going public are reduced by half.

  Patent pendency statistics are a strong indicator of how serious a country is about supporting its own entrepreneurs. If the patent system is to support local innovation, then the patent system needs to serve entrepreneurs with speed and efficiency.

- **Delay Hurts Consumers by Delaying Access to Products.** Patent delay means product delay. Pendency problems deny consumers access to lifesaving drugs and beneficial technology. Research shows that patents make a difference as to whether people can obtain products. Patents matter especially in the case of pharmaceuticals, where companies often must spend significant resources to obtain regulatory approval. Research has shown a link between delayed availability of drugs and weak patent protection. Other research shows a similar link between trade in high tech products and patent rights.

- **Delay Hurts Society.** Patent delay imposes social costs, including lost jobs, lost products, and lost innovation. A report for the UK Intellectual Property Office estimated that combined losses from each year of backlog in the US Patent and Trademark Office, Japan Patent Office, and the European Patent Office costs the global economy over $10 billion a year.[2]

Reasons for and Proposed Solutions to the Patent Pendency Problem

Many patent offices simply lack sufficient examiners to handle the increasing volume of patent applications. There are also deficiencies in processes and infrastructure.

A few possible solutions include:

- **More and better qualified examiners.** Many countries are prioritizing the hiring of new examiners to tackle patent delay and backlog problems. India recently implemented an office modernization scheme in which they hope to nearly double the number of examiners from 337 to 589, and Thailand is training junior examiners to handle more complex applications. More needs to be done along these lines.

- **Work Sharing.** Patents are increasingly filed in multiple jurisdictions. This duplication creates the opportunity to share work or expedite applications that have already been granted by recognized jurisdictions.

- **Removing Obstacles to Final Grants.** Some countries insert additional procedures and reviews in between application and grant. India has a redundant pre-grant opposition procedure, while Brazil subjects pharmaceutical patent applications to double review by both its patent office and drug regulator. Procedures such as this should be re-considered in light of the substantial cost of the delays they introduce. In these specific cases, they are redundant and should be eliminated.

We also consider additional potential solutions such as patent term extension, accelerated examination of applications, and maintaining both speed and quality.

Action Items

Nations' economic strength and progress depend on protecting investments in innovation and creativity. An efficient and capable patent office is a crucial element in guaranteeing these protections. The results of our study show that things are not going well in key parts of the global patent system. This problem calls for action:

- **It's time for a serious global conversation about patent delay.** While some patent offices are working hard on the problem, it's time to recognize that this is a growing global problem. Unless prompt action is taken, it's likely to get worse before it gets better, given the growing number of applications worldwide. Debates about treaty compliance, measures for reform and harmonization, and hopes for and concerns about the effects of patents start to look beside the point when in many countries the patent system is showing signs of breaking under the strain of applications.

- **Let's recognize that a broken, incompetent patent system is in no one's interest.** It breeds uncertainty and makes business planning difficult. It hurts local entrepreneurs, it delays the introduction of new products, and it costs jobs and other social benefits.

- **Provide greater transparency and more data.** When we began this study, we naively hoped our work would largely be a simple matter of collecting publically available data. That was not the case. While some of the biggest patent systems – e.g., the US and the EPO – provide abundant information on all aspects of pendency, publically available data was scarce in many other jurisdictions. We fear that some patent offices may not be tracking necessary information internally either. Solving the problem requires facing up to the statistics we report here while starting to collect and report on patent office performance universally.

- **Get serious about fixing the problem.** While the design of the patent system raises essential policy issues, the day-to-day work of examining patents is a relatively mundane, technical process. The reluctance of some to share work and information indicates misplaced concerns about sovereignty and policy flexibility. Inefficient patent examination furthers no policy goals but causes much harm. Patent examination should be done well as a simple matter of good governance.

- **Start implementing solutions.** There are well-known solutions that more than anything require political will. First and foremost, patent offices need to hire and train more examiners with the right expertise to handle patent applications. They need to become more open to sharing work. They should discuss and try innovative solutions to the common problems raised by patent examination, such as accelerated examination as an incentive to submit streamlined applications. Moreover, any procedure that adds to delay should be subjected to a cost-benefit analysis, particularly if it is a redundant procedure.

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I. Introduction

In April 2001, Microsoft applied for a Brazilian patent on its ClearType technology, which helped smooth text that appeared on a screen so that it did not appear pixelated. ClearType was incorporated into Windows XP, which was released later in 2001. Microsoft applied for patents on the same technology in other countries, including the United States. Patents for ClearType technology were granted in those other countries by early 2002, but Microsoft still awaited its first Brazilian patent. As the years passed, ClearType was incorporated into Windows Vista, and then Windows 7, as well as other Microsoft products such as Word 2007. Microsoft's Brazilian patent application for ClearType was still pending. Then, in 2012, Microsoft began to de-emphasize ClearType. By the time Microsoft released Word 2013, that product did not use ClearType at all. The next year, in 2014, Brazil finally issued Microsoft a patent on the ClearType technology.[3]

Microsoft's experience obtaining a rather stale patent in Brazil was not an isolated instance. Other companies have this same problem in Brazil and elsewhere. For example, in 2015, Thailand issued 16 patents with less than a year of term left – they were all filed in 1995 or 1996. Ten of these 19+ year old patents were pharmaceutical patents. Five of them had 3 months or less of term left. This was not the first time that Thailand's patent office was a generation behind in issuing patents – for example, 2014 saw the issuance of 22 patents with less than a year of life left, and a couple of those patents measured their lifespan in mere days.

In the face of such delays, many of today's most contentious debates about the finer points of the patent system seem almost irrelevant. When delays are so extreme, they effectively deprive patents of most of their value and force.

However, the issue of patent pendency has been somewhat overlooked as countries have worked to make their patent systems more effective over the last two decades. Initially, reforms were spurred by treaty obligations under the Agreement on Trade Related Aspects of Intellectual Property (TRIPS) and other trade agreements. However, many countries have come to see effective intellectual property systems as essential to domestic development. For example, China has whole-heartedly embraced patents as part of its innovation strategy, while India's recently released IP policy also sees patents as key to innovation.

In this drive to improve intellectual property systems, reformers have failed to fully appreciate an important dimension of an effective IP system: the timely review of patent applications. Early implementation of TRIPS naturally focused on getting treaty-compliant laws on the books. Much of the later criticism and debate has focused either on enforcement – or lack thereof – of rights or on the amount of permissible variation in national laws. While not quite ignored, the least studied and discussed aspect of building an effective IP system has been its efficient administration.

This CPIP White Paper is a start at better understanding the global problem of patent pendency. We collect data on how long it takes to get a patent in a diverse group of countries with differing levels of development. While much more work remains to be done to understand the full scope of the problem, its causes, and solutions, our results show that there is indeed a problem with how long it takes to get a patent in some countries.

Getting a patent can take a very long time in some countries – so long that it renders the right meaningless for many purposes. In some countries, applications sit for close to ten years or more on average before finally being approved.[4] By their very nature, patent applications secure rights in cutting-edge inventions. If it takes years to get a patent, the cutting-edge has long since moved on. In that case, the security that a patent could provide comes too late to help many businesses. Even in the United States, where pendency to grant date averages a relatively short 3.2 years as of 2015, innovators complain that patents take too long to get.

The longer it takes to get a patent, the more likely it is that opportunities are lost. Without the security of patent, startup companies may not launch or grow, investors forego investing, companies forego establishing a market for new products, and the public loses the chance to benefit from economic growth and access to technology and medicines. As we discuss in this White Paper, research shows that startup companies and early-stage firms that experience patent delay are far less likely to receive the

funding they need to grow, create jobs and continue to innovate.[5]

One of the reasons for the problem is the increase in demand for patents by both domestic and foreign inventors. Over the past decade, patent offices in countries with rapidly developing intellectual property markets have failed to increase resources to address a rising volume of patent applications, resulting in a strain on the system and uncertainty for those seeking patent protection. Application backlogs are growing and pendency periods are rising in many countries as patent offices struggle to keep up.

While the leading cause of delay appears to be failure to match resources to application volume, some countries have exacerbated the problem by failing to modernize patent office infrastructure. Not only do many jurisdictions lack sufficient examiners to process incoming applications, but they have not developed expedited processing tracks for certain types of applications. Furthermore, many offices do not have systems in place to enable work sharing with other patent offices.

Without secure patent rights, economies may suffer as investors focus their resources on countries where rights are more secure. Nations' economic strength and progress are dependent upon mechanisms that protect innovation and investment in creativity, and an efficient and capable patent office is perhaps most basic to guaranteeing these protections. It's no coincidence that countries with the most developed patent systems and comprehensive intellectual property laws are continually those with the most productive economies.[6]

The problem of patent delay is a matter of good governance. In many ways, it is a simple problem that is challenging to fix. If countries want to improve their innovation economies, they must mind the fundamental task of building a competent, well-staffed patent office.

II. Methodology: Measuring Patent Pendency

In this White Paper, we set out to develop a broad and basic understanding of the global problem of patent pendency. After encountering anecdotes and reports of shockingly long delays in obtaining patents in widely different industries in various countries – Brazil, Thailand, and India in particular – we decided to investigate the issue. We found that the data had yet to be systematically collected for many jurisdictions and that there is a dearth of data-driven, general discussions of the problem beyond the most developed countries. In many instances, obtaining data just on granted patents was challenging, but illuminating, so we chose to focus on that data alone for present purposes.

We thus examined the **average pendency to grant time for patent applications granted in a particular year**, measured from application to grant date, in a sample of 11 countries, in the aggregate and across industries. Another reason we chose to examine this particular metric is that it provides a fairly informative answer to a question that's certain to be important to any patent applicant in any country, whether foreign or domestic: "Assuming I can obtain a patent, how long will it take to get it?" A patent applicant's knowledge or belief about the answer is likely to affect whether it applies for a patent and the business decisions it makes in reliance on the prospect of getting a patent.

We discuss how we collected our data in detail in Appendix 1.

Average time to grant is only one of several ways to measure the problem of delays in processing patents. Depending on the purpose and the available data, other metrics can provide valuable information. We also discuss these other potential measures in Appendix 1.

One reason to prefer time to grant for this report is that it is a simple benchmark that suits many purposes. Many other metrics of patent pendency are more specifically useful to reforming and managing patent office operations. For example, one may wish to determine the total inventory of patents on hand at a national patent office to understand how well the office is keeping up with its workload. While such data is essential to the task of improving patent office operations, it is not readily available for a number of countries—at least publicly, and, one fears, perhaps even internally.

The availability of data[7], which varies greatly among countries, is another limitation on using many of the other potential metrics of patent pendency discussed in Appendix 1. Few countries report comprehensive statistics on average pendency periods. There are exceptions – notably, established patent offices such as the United States Patent Office (USPTO) regularly publish data on patent pendency and the World Intellectual Property Organization (WIPO) provides some information on international pendency in its annual World Intellectual Property Indicators report.[8] However, while these reports focus on important trends in several jurisdictions, there is little available data on some of the fastest growing patent systems.

We considered it important to understand the patent pendency issues experienced in countries such as Brazil, India, Argentina and Thailand. In recent decades, these emerging economies have become important markets and innovators in their own right. Increasingly, both foreign and domestic businesses seek to break into these burgeoning markets with their products and inventions. And, when they do so, they seek to protect their inventions with patents.

Unfortunately, the patent systems and offices in these countries are often ill-prepared for rapid increases in filings, leading to application backlogs and pendency periods of nearly a decade in some case. Because many of these same patent offices do not offer comprehensive statistics on backlog and delay, we had to calculate average pendency periods using the data that was available. As our results in the next section show, determining average time to grant produces informative and illuminating insights into the global patent pendency problem.

III. The Persistent Global Problem of Patent Pendency

An inventor may face a very long wait after he or she applies for a patent, at least in some countries. In fact, we found few countries where average time to grant would be considered "quick" by anyone's standards. For example, in 2015, average time from application to grant in our sample ranged from Korea, at 2.8 years to Brazil at 11.4 years. The U.S. ranked third in our sample at 3.2 years, which appears to be a very positive result relative to the rest of the group. However, this outcome likely says more about just how much of a problem pendency is everywhere, since pendency times in the U.S. are often strongly criticized.

A. Global Overview of Patent Pendency

To provide a general overview, FIGURE 1 shows the average time to grant over the eight-year span in our sample, 2008 through 2015.[9] TABLE 1 shows the average time to grant by jurisdiction by year over the same period.

The overview presented in the summary graph and table yields three key insights:

Neither national wealth, nor relative lack of it, determines how quickly a country's patent office can process applications. One thing that's striking about FIGURE 1 is

FIGURE 1 Average Granted Application Age for Selected Countries 2008-2015 (in years)

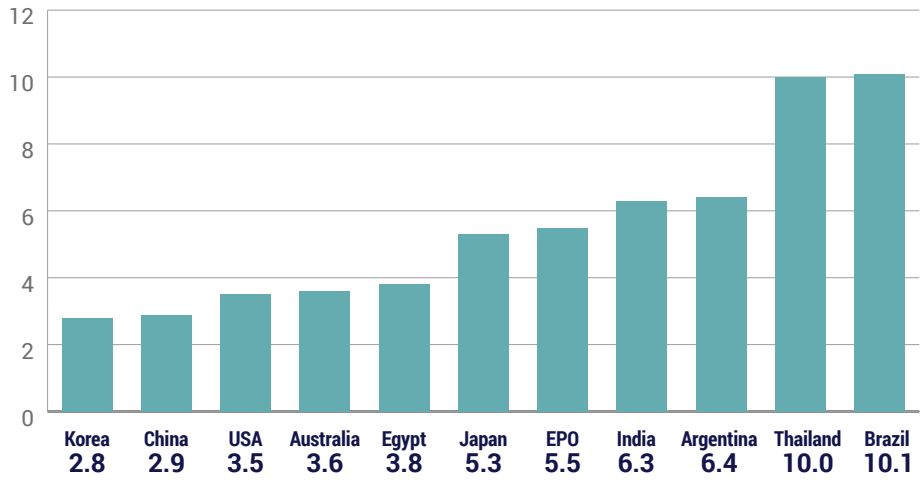


TABLE 1 Average Age of Granted Application by Year

	Argentina	Australia	Brazil	China	Egypt	EPO	India	Japan	Korea	Thailand	USA
2008	6.4	3.9	8.6	2.0	2.6	5.1	5.9	6.4	2.3	8.9	3.5
2009	6.2	4.2	9.4	2.1	2.8	5.3	5.7	6.4	2.5	9.2	3.7
2010	6.2	4.0	10.0	2.8	5.3	5.4	5.7	6.4	2.9	9.7	3.8
2011	6.9	3.6	10.0	3.4	4.9	5.5	5.8	6.1	3.1	11.1	3.7
2012	6.6	3.8	10.1	3.5	3.4	5.6	6.0	5.4	3.2	11.1	3.6
2013	6.5	3.6	10.9	3.2	2.9	5.7	6.8	4.7	3.0	10.6	3.4
2014		3.0	10.9	3.1	3.3	5.7	7.2	4.1	2.9	9.9	3.4
2015		3.0	11.4	3.0	5.4	5.8	7.6	3.3	2.8	9.9	3.2

that national wealth (as measured in terms of GDP per capita or absolutely) does not correspond to average grant times. One might expect that patent-processing times would line up at least roughly according to the resources at a government's disposal, but that's not the case. First, while the U.S. is the wealthiest country in the sample, its patent office is not quite the quickest with respect to average time to grant. Even more remarkable in this regard is that Japan and the EPO rank in the middle of the sample, by over two years.

There is also a disparity among major emerging markets. China has one of the speediest patent offices, with an average of 2.9 years, while its fellow BRIC country Brazil, comes in last in the sample with an average of 10.1 years. India lies between with an average of 6.3 years.

Egypt, with the second lowest GDP per capita in the sample (next to India), and a tumultuous recent history, ranks better than Japan and the EPO, as well as India, Argentina, Thailand and Brazil. (As seen below, Egypt's average time to grant has varied over the years, and was longer than Japan's much-improved pendency to grant time in 2015).

While our sample is too small for useful inferential statistics, this result does indicate that at least in these important jurisdictions, a country's wealth does not determine whether it can or cannot process patent applications promptly.

It takes a really long time to get a patent in Thailand and Brazil. While it is obvious at a glance, one fact nevertheless cries out for comment: It takes a really long time, on average, to get a patent in Thailand and Brazil – over ten years. One might argue whether the smaller time differences at the shorter end of the scale, e.g. between the U.S.A. and Korea, make a difference (but see below in Section VI – it seems likely they do). One could also question whether faster is always better, since doing a job fast does not necessarily mean one is doing it well.

But quantity has a quality all its own, and ten years – half the term of a patent – is inarguably a long time. In absolute terms, ten years is a long time in the life of an individual inventor, let alone a business or a cutting edge technology. Ten years ago as of this writing, the smart phone revolution had not yet taken off. In the coming ten years, the next Microsoft or Google could be founded and rise to dominate the business and tech world. Waiting ten years to see how a patent application turns out is simply not going to be practical or helpful for most inventors, businesses, and technology investors.

New leaders in patented innovation are emerging. Many have begun to note that certain rising nations, including China and Korea, are embracing the opportunities presented by patented innovation. As Prof. Jonathan Barnett observed in a recent paper sponsored by this Center,[10] emerging "patent tigers" have embraced patenting as a way to develop their innovation economies. China and the Republic of Korea show as leaders in our survey; at the very least they process patent applications efficiently. While time to grant is only one metric of a patent office's effectiveness, it does indicate a commitment to patented innovation.

B. Global Trends in Patent Pendency

The overall volume of patent applications has consistently increased across most jurisdictions over the last decade, and some patent offices have withstood the flood better than others. The World Intellectual Property Organization reported global growth of patent filings in 2014 of 4.5%, with some developing countries experiencing surges of nearly three times the global rate.[11]

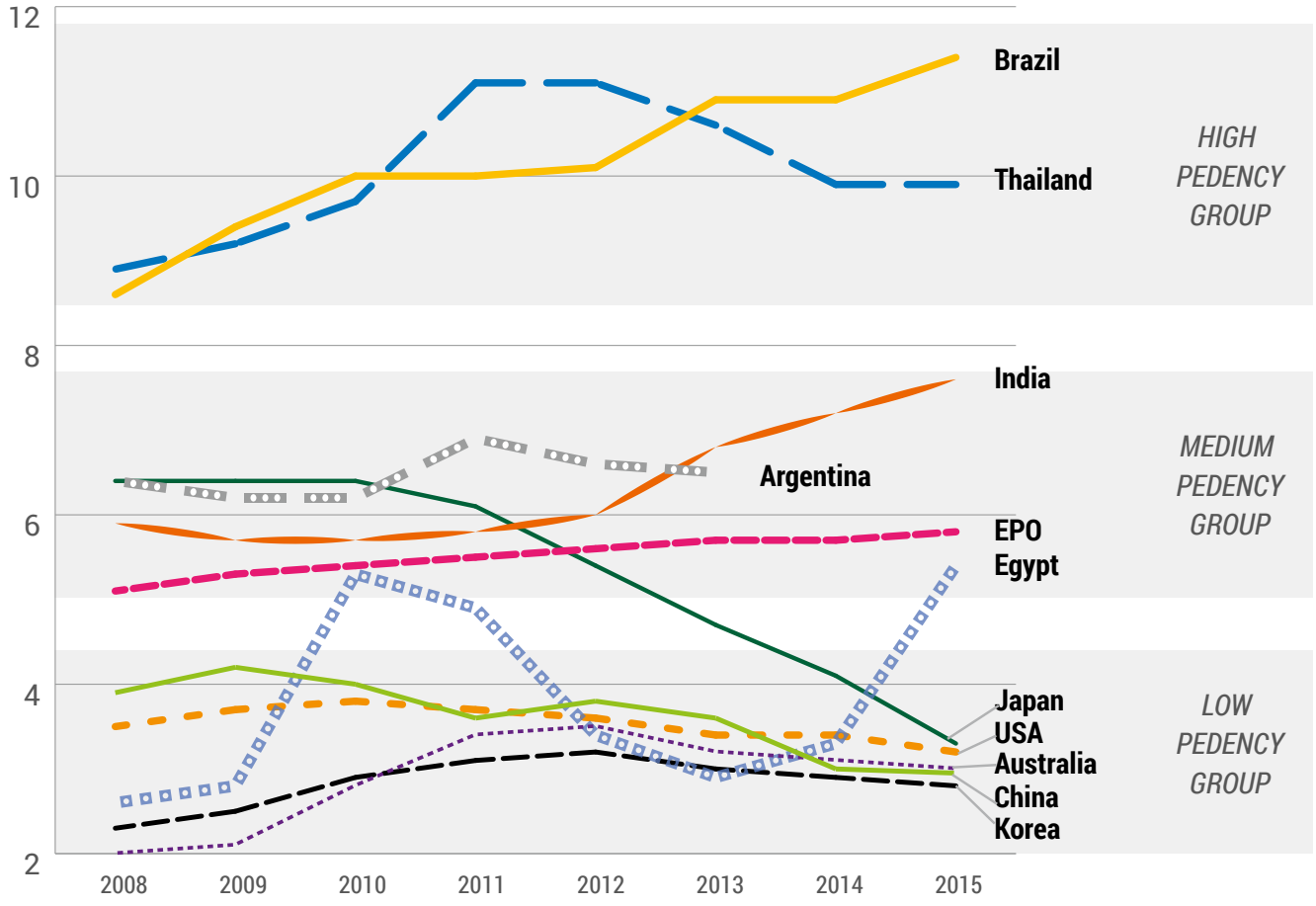
In 2014, there were 2.7 million applications filed worldwide.[12] Leading the way in total number of applications in 2014 was China, with 928,177 filings, followed by the US (578,802), Japan (325,989), the Republic of Korea (210,292) and the European Patent Office (EPO, 152,662).[13] China saw growth of 12.5% in 2014 and, if the trend continues, is poised to become the first patent office with over one million applications received in one year.[14]

While application growth rate was more restrained in the US (1.3%), the EPO (3.2%), and the Republic of Korea (2.8%), countries with developing patent systems saw percentage increases in applications on par with, and sometimes surpassing, China's substantial rate.[15] The Philippines (9.3%), Thailand (7.1%), and Vietnam (11.3%) all saw significant increases in applications in 2014, but the most staggering increase was in the Republic of Iran, which experienced a growth of 18.5%.[16]

How are countries coping with this rising tide of patent applications? In our sample, the outcomes are mixed, with pendency in a few countries holding steady, one improving, and several getting worse.

Over the course of the period we examined, most countries maintained their positions relative to the rest of the sample. As FIGURE 2 shows, there are roughly three groupings of countries:

FIGURE 2 Trends in Patent Pendency 2008-2015



- **High Pendency:** Brazil and Thailand fall into this group, ranging from just over 8.6 years to 11.4 years to grant.

- **Medium Pendency:** The Medium Pendency Group ranged from 5.1 to 7.6 years to grant, including Argentina, India, and the EPO. Japan started in this group, but dropped to the Low Pendency Group in recent years, while Egypt moved between the Medium and Low Pendency Groups.

- **Low Pendency:** The Low Pendency Group ranged from 2.0 to 4.7 years to grant and included China, Korea, the U.S., Australia, and, by the end of the period, Japan.

The only major "success story" was Japan, as it significantly reduced average time to grant from 6.4 in 2008 to 3.3 years in 2015. Still, other countries are achieving some success in making inroads on the pendency problem, despite growing application volume – notably the U.S. has dropped from 3.8 years to 3.2 years to grant since 2010.[17]

Of course, while speed is important in processing patents, so is accuracy. Emphasizing speedy review could come with the cost of poor-quality patents slipping through the cracks. However, at least based on reputation and visible efforts, speed in patent processing does not necessarily equate with lack of care. Some countries have worked to improve both pendency times and quality, notably Japan and the U.S. We discuss these efforts later. Meanwhile, lengthy examination times do not equate with care. In the countries with the lengthiest delays, there are few signs of painstaking examination such as extensive back-and-forth between examiners and applicants. Rather, long pendency periods appear to be more likely a function of the length of the queue rather than what happens to the application once it reaches the front of the line.

In any event, too much speed is not the primary problem that the global patent system faces today. Our study reveals a different concern about the health of the patent system, that examination times are long and getting longer. Pendency to grant time has been increasing in countries with already relatively long pendency periods. Given that these countries are working from several years behind, they have yet to tackle most of the recent large increase in applications. For example, both India and Brazil's pendency to grant has increased. Given that average pendency to grant in 2015 each of these countries was, respectively 7.6 and 11.4 years, it is likely that the current average granted patent was filed before or during the economic downturn caused by the global financial crisis. With increasing applications coming in later years, processing applications will likely get more challenging in years to come.

IV. Global Trends by Industry

One question sometimes asked is whether certain fields of technology tend to drive up overall average pendency because both their subject matter and patent applications are complex. Another way to ask that question is whether some fields are worse off than others. To examine this question we broke out a few important fields of technology and looked at average times to grant for each. This distinction was important to determine whether or not pendency to grant time differs among technologies.

However, to avoid overwhelming detail, we aggregated a few key groups of technology fields into more informative industry categories. For our study we focused on eight classifications falling into **three broad groups:**

- **Mobile Technology.** Given the importance of the revolution in mobile technology, we collected data on pendency times for patent applications in the industry classification most relevant to mobile technology: *audio-visual technology, digital communications, and telecommunications.*

- **Life Sciences.** Anecdotally, patent applications in the life sciences sector are said to experience tremendous delays. To determine how such applications fared in both absolute and relative terms, we gathered data on: *biotechnology, medical technology, and pharmaceuticals.*

- **More "Mature" Technology.** By definition, patents always cover the latest and most cutting edge technologies. Nevertheless, while no currently patentable invention should ever be "old," some fields have a longer history, where formal education has been available for generations and knowledgeable examiners are likely relatively easier to recruit. We decided to look at inventions in a couple of such fields to provide a baseline of sorts and to see if such fields varied from younger fields. For this admittedly somewhat artificial category, we thus gathered data on: *chemical engineering and engines (pumps and turbines).*

A. Setting a Baseline: Mature Technologies

While we wanted to track pendency times for patents in some of the most dynamic, cutting edge technologies in our study, tracking "mature" technologies' pendency times provides a valuable comparison and baseline when assessing patent delay across many technological classifications. TABLE 2 shows performance in this category over the past 5 years.

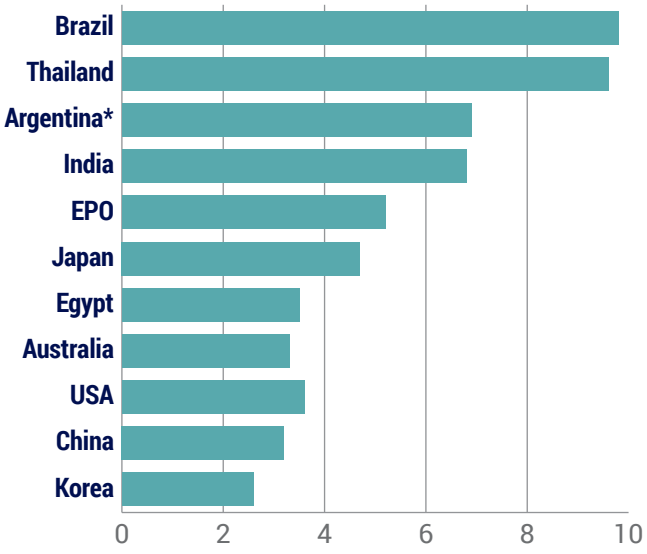
We expected to find that patents for "mature" technologies would be processed, on average, somewhat faster than patents for mobile technology and life sciences. The results confirmed this hypothesis: Average time to grant for applications for "mature" technologies was almost always less than for life sciences or mobile technology, and the differences were almost always statistically significant. Thus, one can fairly say that patent applications for mature technologies are, on average, likely to be processed faster.

TABLE 2 Average Age of Granted Mature Technologies Application by Year

	Argentina	Australia	Brazil	China	Egypt	EPO	India	Japan	Korea	Thailand	USA
2011	7.2	3.4	9	3.3	3.6	5	5.8	5.9	2.5	10.1	3.6
2012	7	3.6	9.2	3.4	3.1	5.3	6.1	5.1	2.9	10.2	3.6
2013	6.5	3.4	9.8	3.2	3.1	5.3	7	4.5	2.7	10.1	3.6
2014		2.9	10.5	3.2	3.9	5.3	7.3	4	2.5	9.3	3.6
2015		3.1	10.6	3	3.8	5.4	7.6	3.9	2.4	8.5	3.5

However, the results for mature technologies were still generally consistent with the overall trend and magnitude of average processing time in each country, i.e., countries with long average pendency times in general had long average pendencies for mature technologies too. As the tables and graphs that follow show, country rankings do not change much, if at all, between technologies, nor does the relative degree of delay. For example, as FIGURE 3 shows, it takes nearly a decade for "mature" technology applications to be processed in Brazil and Thailand.

FIGURE 3 "Mature" Technology:
Average Age of Granted Patents (Years) 2011 – 2015



B. Mobile Technologies

In recent years, one of the most important technological developments has been the revolution in mobile communications technologies. In fewer than three decades, new technologies have enabled the creation of seamless mobile networks; vastly increased voice call capacity, bringing mobile to the masses; then increased data capacity, bringing broadband internet to mobile consumers; and then developed the modern smartphone, which has become a user-friendly platform for a vast number of apps that improve people's lives.

For our study, we aggregated a category of mobile technologies that covers fields most directly affected by these technological developments: digital communications, audio-visual technologies, and telecommunications. For many of the countries reviewed, pendency time over the five years from 2011-2015 was about six months to a year longer than "mature" technology pendency. Unfortunately, for the countries experiencing the most significant patent delay problems, pendency was anywhere between two and four years longer.

Our results reveal that several countries are behind the curve in securing the technological investments that have led to the mobile revolution. It is telling to benchmark a few milestones in the development of mobile technology versus the average age of mobile technology patents granted: For example, LTE networks were first rolled out commercially in many countries in late 2010. By 2015, Brazil, Thailand, India, and the EPO were still issuing mobile technology patents that pre-dated this milestone. In 2007, Apple's iPhone launched the modern mass-consumer smartphone era. In 2015, Brazil and Thailand were issuing mobile technology patents that on average significantly pre-dated the first iPhone.

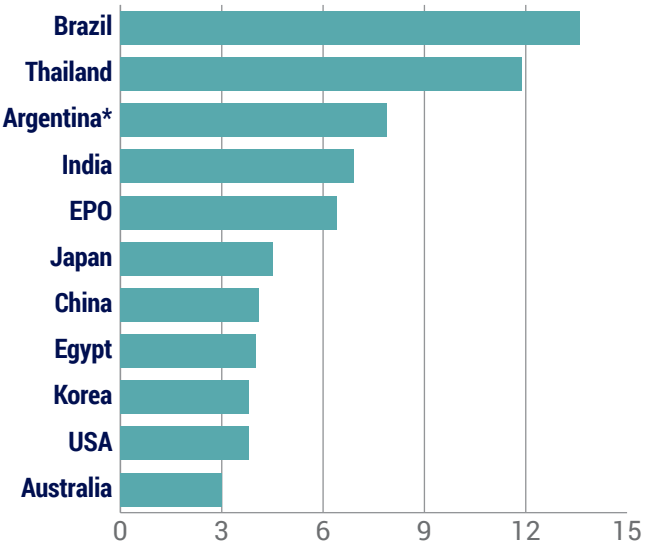
TABLE 3 Average Age of Granted Mobile Technologies Application by Year

	Argentina	Australia	Brazil	China	Egypt	EPO	India	Japan	Korea	Thailand	USA
2011	9.1	3.4	13.1	4	4.2	6.3	6	5.7	3.8	12.4	4.2
2012	6.6	3.2	12.9	4.3	3.5	6.4	6.2	5	3.8	13.1	4
2013	8	3.1	13.6	4.2	3.4	6.5	7.1	4.4	3.8	11.7	3.8
2014		2.7	14	4	3.6	6.4	7.7	3.8	3.8	11	3.6
2015		2.7	14.4	3.9	5.4	6.5	7.8	3.6	3.7	11.4	3.2

In fact, Brazil's average age for granted mobile technology patents in 2015 was 14.4 years, the highest average for any year in any category in our study. Brazil's "newest" mobile technology patents in 2015 were, on average, from the era of flip phones and the early spread of 3G networks – representing more of a time capsule than cutting edge technology.

FIGURE 4 illustrates the average length of time to grant for mobile technology patents from 2011 – 2015.

FIGURE 4 Mobile Technology: Average Age of Granted Patents (Years) 2011 – 2015



C. Life Sciences

Many reports indicate that patents in the life sciences are among those that suffer the most from pendency problems. Our research confirms those reports. It is notable, however, that they were neither alone in suffering from great delays nor always subject to the greatest average delays.

Generally, life sciences pendency averages followed the same trends we found in mobile technologies and "mature" technologies. The more efficient countries tend to process these applications in anywhere between two and four years on average. On the other end of the spectrum, Thailand and Brazil consistently average well over ten years in life science application pendency.

FIGURE 5 shows the average age of granted patents in life sciences fields from 2011 – 2015. It takes a long time to get a patent in these fields in several countries, with Brazil and Thailand topping the list. Some of the averages observed are even greater when the life sciences field is split into its component fields. Most notably, it now takes about 16 years on average to get a pharmaceutical patent granted in Thailand.

Such long pendency periods are particularly likely to affect product decisions and consumer welfare when they occur in life sciences fields. First, the fate of single patent tends to be more closely linked to the fate of the product, since there are fewer patents per product in this field – often the ratio approaches 1:1. Second, life sciences companies really need patents to realize a return on their investments in both R&D and commercialization. Unlike, for example, mobile handset manufacturers, drugmakers are far less able to compete on brand reputation, appearance,

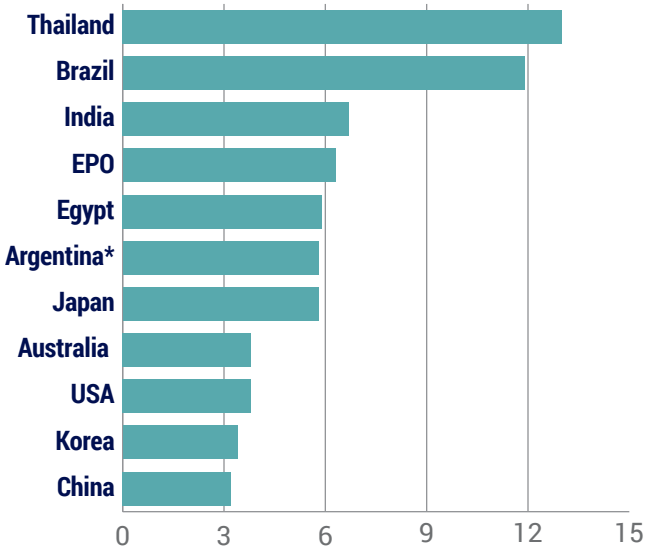
TABLE 4 Average Age of Granted Life Sciences Applications by Year

	Argentina	Australia	Brazil	China	Egypt	EPO	India	Japan	Korea	Thailand	USA
2011	6	4.1	11.4	3.4	5.7	6.1	5.7	7.1	3.4	12.9	4.1
2012	4.9	4.1	11.3	3.4	5.3	6.3	6.2	6.4	3.7	13	3.8
2013	6.6	4.2	12.4	3.2	6	6.3	6.7	5.6	3.5	11.6	3.6
2014		3.5	12.3	3	6.6	6.4	7.1	5.1	3.2	13.2	3.7
2015		3.2	12.2	3	5.8	6.5	7.6	4.6	3.1	14.1	3.7

features, colors or other differentiating factors. Medical necessity and regulatory requirements restrict product differentiation – unless it is an entirely different medicine, the competitor's product must be essentially the same. Price competition is thus a bigger factor, and the first company to create a product and invest in building a market is actually at a disadvantage to a follow on competitor, whose total and average costs will be much lower.

A long patent pendency period may thus deter a drugmaker from entering a market. Until a business knows that it can protect its investment, it is less likely to spend resources to secure regulatory approval and to build awareness of its product among health care providers through education and marketing. If a company takes a wait-and-see approach until it receives a patent, then consumers could be in for a very long wait in countries such as Thailand and Brazil. Recent studies have shown a link between weak patent protection and delayed market entry of drugs.[18] These dramatic results regarding average delays in patent grants warrant further research to determine how much slow patent processing is to blame for delaying the entry of new medicine into a market.

FIGURE 5 Life Sciences:
Average Age of Granted Patents (Years) 2011 – 2015



D. Conclusions Regarding Global Trends by Industry

Our review of global trends by industry regarding average patent grant times reveals three key insights:

The issue of lengthy pendency times for patent applications is not confined to cutting edge industries. While patent applications for more established, "traditional" technological fields tend to be processed more quickly on average than patent applications in mobile technology and life sciences, they still suffer from delays in some countries. Slow processing appears to be an issue that is consistent across a patent office's operations, rather than confined only to "difficult" fields.

Lengthy pendency is an issue for both the high tech and life sciences industries. In some cases, the patent system poses different challenges and problems for different leading industries. By contrast, the pendency issue appears to be a shared challenge. Both mobile technology and the life sciences suffer from high average pendency periods in Brazil, Thailand, and other countries. This finding indicates a problem with resources across the board, rather than with shortages of particular types of expertise or oddities with respect to certain types of applications.

For many industries, some countries' average wait times render patents largely futile. In some countries, applicants in some fields must, on average, burn through more than half the length of a patent term waiting to receive a patent. An even more widespread problem is that much or all of the truly useful life of a patent is spent waiting, given the pace of advancement and obsolescence in some industries. When wait times stretch so long, patents largely become a big company game. Multinational companies and other large businesses may have the resources to sustain momentum over such long waiting periods, even as many of these applications fade in relevance. By contrast, individuals and small and medium enterprises lack the resources and time to wait. Countries with long wait times for patents almost certainly hurt local entrepreneurs the most.

V. Why Patent Delay Matters

While we have documented that it takes a long time to get a patent in many industries and countries, one might question why such delays matter. Delays matter because patents matter. Patents secure the investment a business makes in developing and commercializing a product. They thus affect decisions about which businesses get investments, which products get launched, whether a business gets off the ground, and other key decisions. Without the security provided by a patent, these things often simply don't happen or they at least must wait until a patent is granted.

While a patent may issue eventually, an opportunity deferred is often an opportunity lost. Just consider how attractive an opportunity today to invest in a flip-phone manufacturer, MP3 player, online auction site, new search engine, or online bookstore/general retailer would sound. If one's business depends on waiting for a patent for security – whether it is to launch a business or secure investment – then too long of a wait may ensure that one's wait never ends.

Similarly, for consumers and society as a whole, delay has costs. Lost business opportunities are also lost opportunities for people to benefit from innovative products, whether they are beneficial drugs or life-improving mobile apps. They are also lost opportunities for jobs. And even where the opportunity is not lost but rather comes later as products are delayed, the wait costs income and could come too late for those who need innovative cures or other benefits sooner rather than later.

Here are three ways in which patent backlog hurts a country's economy:

Delay Hurts Entrepreneurs. A new business often has little in the way of reputation, goodwill, business relationships, economic clout, or physical assets to secure an investment. Patents assure everybody involved – the founders, early employees, investors, and business partners – that a business can develop its product with some protection from the risk of a bigger competitor simply copying the product and taking the market away. Startups are always a risky proposition, so many business decisions end up waiting on the grant of a patent.

Recent research by a scholar in this Center's Thomas Edison Innovation Fellowship, Deepak Hegde, has demonstrated this point. Hegde, along with his co-authors Joan Farre-Mensa and Alexander Ljungqvist produced a study titled "The Bright Side of Patents." [19] The study showed with empirical data that patents help startups create jobs, grow their sales, innovate, and reward investors, demonstrating a causal connection between patent grants and startup success. They found that a first-time patent grant increased the probability that a startup would receive venture capital by 53%, and the effect was strongest for inexperienced entrepreneurs.

Even more important for present purposes, the study found that delays in obtaining a startup's first patent impair its performance. Every year of delay reduces the startup's employment and sales growth over the five years following its eventual approval by 21% and 28%, respectively. Delays also hurt a startup's ability to innovate, reducing the number and quality of its subsequent patents. Furthermore, for each year of delay, the startup's chances of going public are reduced by half.

It is important to note that this study looked at U.S. patent applications. Results certainly would differ across countries given differences in capital markets and other institutions. Nevertheless, the study makes a valuable contribution by confirming what conventional wisdom, intuition, and theory all say: Patents facilitate startups' access to capital by both relieving their own concerns about the security of their intellectual property and by easing investors' concerns about the quality and future of the startups they're funding. The longer these concerns persist in light of a delayed patent grant, the less likely a business will ever come to fruition.

Patent pendency statistics are a strong indicator of how serious a country is about supporting its own entrepreneurs. If the patent system is to support local innovation, then the patent system needs to serve entrepreneurs with speed and efficiency.

Delay Hurts Consumers by Preventing or Delaying Access to Products. Businesses often must spend significant resources to build a market for a new product. In some instances, they may hesitate to make the investment to build that market if a competitor can easily appropriate it. And if they hesitate, consumers may have to wait a long time for a new product to appear.

Research supports this point – patents make a difference as to whether people can obtain products. They matter especially in the case of pharmaceuticals, where companies often must spend significant resources to obtain regulatory approval. They are unlikely to spend those resources without patents to secure them, especially in countries without regulatory exclusivity. As discussed earlier in this White Paper, research has shown a link between delayed availability of drugs and weak patent protection.[20] Other research shows a similar link between trade in high tech products and patent rights.[21]

The bottom line is that patent delay means product delay. Pendency problems deny consumers access to lifesaving drugs and beneficial technology.

Delay Hurts Society. One typically cannot attribute a stagnant economy or disadvantaged society to one particular cause, but economists and scholars agree that an inefficient patent system can result in broader costs to society if incentives for innovation and commercialization are diminished.[22] In its report on patent delay for the UK IP Office, London Economics warns that increased pendency leads to a reduction in the value of patents, which then leads to fewer applications filed.[23] Uncertainty over application processing and the eventual abbreviated term of patent protection scares away investors, both foreign and domestic. As patent value drops, applications dwindle, and investment is deterred, innovation suffers and society is deprived of the technological advances that contribute to a better quality of life. London Economics estimated that combined losses from each year of backlog in the US Patent and Trademark Office, Japan Patent Office, and the European Patent Office costs the global economy over $10 billion a year.[24]

There really is no good that comes from a struggling, perpetually backlogged patent office. Local entrepreneurs are discouraged and impeded from launching their businesses. Consumers must wait longer for many new products to appear. Economic development is stifled and societies are deprived of a better standard of living. As a matter of good governance alone, countries should be living up to the spirit of their treaty commitments by running a reasonably effective patent office. As a matter of their own citizens' welfare, countries should be striving to build a first class patent office.

VI. Causes of and Potential Solutions for the Patent Delay Problem

National and regional patent offices have a challenging job under the best of circumstances, a job that calls for good governance, sufficient resources, and frequent innovation. The nature of patents means that patent offices will always be on the leading edge of technological change, which is an unpredictable and demanding place to be. To honor its country's treaty obligations and to serve its inventors, entrepreneurs, and citizens well, a national patent office must have sufficient funds and examiners, as well as a commitment to processing patents promptly.

Patent offices must be innovative and flexible as they meet these ever-changing challenges. Just keeping up with a growing workload calls for new approaches. The number of patent applications has been increasing dramatically over the last fifteen years, both as a result of increased innovation and the expansion of patentable subject matter.[25] Furthermore, a rush for international patent protection has resulted in a flood of applications in different jurisdictions all over the world.[26]

Unfortunately, the patent office infrastructure in many countries is ill-prepared for rapid increases in intellectual property activity, leading to application backlogs and pendency periods of nearly a decade in some jurisdictions.[27] And while patent delay can largely be attributed to the sheer volume of applications some countries are facing, other factors contribute greatly to extended pendency periods.

The UK Intellectual Property Office published a report in 2010 that attributed the patent backlog problem not just to the increase in the number of applications being filed, but also the size and complexity of those applications.[28] Emerging sectors and the development of complex technologies have resulted in longer applications that include many different claims, requiring more thorough and often lengthy examination.[29] Furthermore, the study suggests many applicants employ strategies to purposefully delay examination by submitting extremely broad claims, a tactic that can ensure some protection while further research and development is conducted.[30]

In some developing countries such as Brazil, the recognition in the late 1990s of patent rights in new technologies such as pharmaceuticals and biotechnology led to backlogs and delays that still hinder the patent system today. As patent attorney and intellectual property expert Gabriel Di Blasi explains, Brazil's patent office did not have sufficient examiners to handle the overwhelming increase in applications, and suffered from examiner strikes and work stoppages.[31] Critics of patent delay in India also blame a lack of examiners for long pendency periods: "As of 2012-13, India had a total of 201 patent examiners across the four offices located at Delhi, Mumbai, Chennai and Kolkata. This was only slightly up from 140 examiners in 2005-06." [32]

Because patent laws are territorial, it's also necessary for applicants to file in every country and jurisdiction where they seek protection. This requirement leads to virtually identical patent applications filed across many jurisdictions, resulting in a gratuitous redundancy that could be avoided with certain harmonization mechanisms.

There are many factors that contribute to a patent office's ability to process applications in a timely manner, not the least of which is an established and experienced infrastructure. But faced with increasing applications and growing backlogs, even the most dependable jurisdictions have had to supplement their infrastructure and implement new procedures to maintain an efficient processing system.

A. More Examiners

For many patent offices, the problem is simply not having enough examiners to process the large number of applications coming in. Many developing countries are now prioritizing the hiring of new examiners to help tackle the patent delay and backlog problem.

The Indian Patent Office recently implemented a hiring scheme for the "modernisation and strengthening of intellectual property offices" in which it plans to increase the number of examiners from 337 to 589.[33] Additionally,

the office plans to hire 263 temporary contract examiners and increase the number of supervisory officers or "controllers" from 94 to 170.[34]

Gabriel Di Blasi also stresses the need for more examiners in his article on patent delay in Brazil:

> The INPI needs to move forward with hiring and training new examiners, especially in pharmaceutical and biotech areas, and review the guidelines for examination in order to simplify the procedures of the examiners for examination.[35]

Thailand has also acknowledged that it is suffering from a lack of examiners. A reporter for IAM Magazine recently found that the Thai patent office showed him figures indicating that Thailand "had the highest ratio of patent applications to examiners of any ASEAN country." [36] The Department of Intellectual Property has been authorized to hire 72 new examiners and the Deputy Minister of Commerce is targeting new recruits in an attempt to reduce backlog.[37]

Global patent consulting firm Rouse IP recently released a report with suggestions for accelerating patent prosecution in Thailand in which it pointed out that although the Thai patent office has not yet reached its goal of hiring new recruits, junior examiners are being trained to handle more complex applications and that "the involvement of the Ministry of Commerce is a good sign that Thai officials are starting to take patent prosecution matters more seriously with the hope of using patent as a driving force of the Thai economy." [38]

Hiring more examiners is the single most important potential reform, provided that such examiners are qualified and trained well. As things stand at the moment, many patent offices have too few examiners for an increasing number of applications. More hands and minds for the job would reduce the backlog, or at least help to keep up.

B. Work Sharing

Innovation today is an international game played across global markets, and the need for patent protection both domestically and abroad has led to applicants filing in a number of jurisdictions. In 2010, London Economics estimated that approximately one-third of all applications to the ten patent offices investigated in its study were duplicate applications.[39] This phenomenon leads to the same applications being reviewed by many patent offices around the world, burdening patent systems that will eventually grant identical patents.

To confront this issue of redundancy, nations with established patent systems have worked to create harmonization procedures that allow offices to expedite applications that have already been reviewed and granted by certain offices. The Patent Co-operation Treaty (PCT) was implemented almost 50 years ago in an attempt to assist applicants seeking international protection, offering an efficient way to apply for protection in over 140 member countries.[40] But while the PCT consolidates the international filing process and saves applicants some filing costs, individual patents still must be examined separately in the different jurisdictions that the applicant seeks protection.[41]

In 2006, the United States and Japan began a work sharing program called the Patent Prosecution Highway (PPH) which allows for applications filed in certain recognized offices to be expedited in corresponding offices if the original office finds at least one patentable claim.[42] In its report on patent delay, London Economics explains how information provided by the original filing office can clear the way for more efficient processing in other jurisdictions. Work sharing "then allows the second office to benefit from the work done previously, reducing the examination workload and potentially improving patent quality. For instance, as available databases vary between different offices, this may allow the second office to identify prior art that they would otherwise have been unaware of." [43]

Over the past ten years, work sharing programs such as the PPH have been limited to members with well-established patent offices, but recent expansions aim to include countries with developing systems that are struggling to process a high number of applications. In early 2016, the USPTO and Brazil's National Institute of Industrial Property (INPI) announced a two-year pilot PPH program in which "an applicant who receives a positive ruling on a patent claim(s) from either the Brazilian National Institute of Industrial Property (INPI) or the USPTO may request accelerated prosecution of corresponding claim(s) in the other office." [44]

In 2014, Thailand's Department of Intellectual Property (DIP) and the JPO commenced a similar pilot PPH

program focused on fast tracking certain applications in Thailand.[45] While the program is limited to certain ASEAN (Association of Southeast Asian Nations) countries, Thailand hopes to cut down on pendency periods that hover close to ten years.[46] With the trial period just concluded, a review and assessment of the impact of the program should be forthcoming.

Whatever the scheme, work sharing strategies are integral to reducing examiner workload and application backlog. London Economics points out that reducing patent office backlogs will in turn have an impact on applicants through reduced average pendency times and fewer wasted resources associated with non-patentable applications.[47] Perhaps most vital, more efficient application processing will help alleviate uncertainties relating to the scope of patent rights, spur investment, and bolster a country's innovative economy.

C. Accelerated Examination

Many patent offices have adopted some sort of accelerated examination option, although the conditions an applicant must meet to take advantage of the programs and just how quickly the application is processed can vary greatly from one jurisdiction to another.

In some instances, accelerated examination appears to simply move the workload around by favoring some technologies and applicants over others. If that is all accelerated examination does, then it is a zero-sum game, with some applicants stepping to the head of the queue as the rest of the line is pushed back.

Nevertheless, accelerated examination could be beneficial for the patent delay problem if it serves as an inducement for applicants to file applications that are easier to examine. In 2006, the USPTO began offering such an accelerated examination program.[48] In order for an applicant to receive accelerated examination, the application must be limited to three or fewer independent claims, or twenty or fewer total claims.[49] Additionally, applicants must assist the examiner by providing statements ensuring that certain pre-examination searches were conducted.[50]

Brazil made recent changes to Brazilian Industrial Property Law (LPI) to allow for expedited examination that are more in the nature of resource shifting. Accelerated examination in Brazil is available (1) when the applicant is older than 60 years, (2) if the object of the patent application is being counterfeited by third parties, or (3) if the grant of the patent is a condition to the achievement of financing from development agencies or a Brazilian official credit institution for exploration of the product or process object of the patent application.[51] These provisions tend to address the symptoms for some applicants without alleviating the overall problem.

Some countries have accelerated processes for favored technologies, such as green tech. Brazil has implemented the Green Patent Program, which aims to process applications for green technologies within two years.[52] The USPTO has a similar program called the Green Technology Pilot Program that accelerates applications based on alternative energy, conservation and the development of renewable energy sources.[53] These programs appear to simply shift resources from less politically favored technologies.

India's recent changes are more directly aimed at systemic issues. In an attempt to cut pendency periods and encourage innovation in India, the Department of Industrial Policy and Promotion (DIPP) recently introduced a program to expedite patent processing and cut filing costs for startup companies. The "tatkal" systems aims to immediately cut the time period for processing applications for startup technologies from between five to seven years down to two and a half years, and then down to one and a half years by 2018.[54] The new benefits will also recognize startups as individuals, rather than companies, significantly reducing the costs associated with filing and defending an application.[55]

Another part of India's new program will address patent backlog by allowing applicants to withdraw patents without a fee, and to recoup nearly all of the filing expenses already incurred.[56] With nearly 240,000 pending applications, the DIPP hopes applicants will take advantage of the opportunity to abandon applications that cannot be commercialized or have since become useless and in doing so unclog the patent system in India.[57]

Accelerated examination is only a solution if acceleration occurs across all applications. This goal can be achieved through programs that make systemic changes, as the U.S. and India have attempted to achieve. On the other hand, while programs that simply favor certain technology categories may accomplish other policy goals, they will not result in lower average pendency periods.

D. Partial Remedies: Term Extension and Restoration

Excessive delays diminish the value of patents by exhausting much or all the term of protection for a patent that is eventually granted. This is especially true for key pharmaceutical patents that lose substantial portions of their terms while the drugs undergo extensive testing, trials, and review.[58] Some jurisdictions have implemented measures to compensate for the harm from regulatory or patent office delays by offering term extensions and restorations. However, so far these remedies only provide a partial restoration of the time and value lost during prolonged delays.

One of the most prominent examples of such an extension is the U.S. Drug Price Competition and Patent Term Restoration Act — known as the Hatch-Waxman Act — which provides drug makers with a term extension equal to one-half of the time lost during the pre-market, investigational new drug (IND) period.[59] The Act was meant to provide an incentive to pioneering, research-based pharmaceutical companies to develop new drugs by restoring the patentee to the position that it would have been in, if not for the lengthy processing and approval delays that prevented it from commercializing its patents.[60] Similar regulations followed in Europe in the early 1990s when the European Economic Community began allowing certain patent applicants to apply for a supplementary protection certificate that would extend the duration of patent protection.[61]

In Brazil, Article 40 of the Industrial Property Law guarantees a minimum patent term of 10 years from the date of grant. Brazil's 10-year "guarantee" would be a laudable compensatory measure – a "consolation prize" of sorts – if long pendencies were the exception, not the rule. As long pendencies are in fact the norm in Brazil, it is instead an inadequate patch on a dysfunctional system. The average pendency to grant has become so long in Brazil – 11.35 years in 2015 – that the average patent granted in Brazil will now expire after its "natural" lifespan of 20 years. This is very much a second-best solution for all concerned: Inventors face long, uncertain waits for patent grants as their technologies grow stale and business opportunities fade. Meanwhile, consumers wait for products to be introduced to the Brazilian market. However, in the instances where the finally-granted patent still has value, competitors and consumers must wait for the expiration of a patent that, on average, now lasts beyond the normal 20 year period, and likely has expired in other countries.

In many jurisdictions, patent term extensions are not available for either regulatory or patent office delay, including in India, Argentina or Thailand, and even if they were, it's not clear that they would provide enough added security to reassure innovators and investors.[62] Research shows that even in the United States where extensions are available, the average effective life of a restored patent remains well below that of a standard patent, and that the amount of time restored is often much less the one-half time of delay promised by Hatch-Waxman.[63] Such is also now the case with Brazil's guaranteed 10 years, since by definition it is capped at less than the full term of a patent. Even in the most egregious case, where a patent was granted near the end of year 19, the 10 year extension would only make up for about half of the delay. As they stand, Hatch-Waxman and similar extension provisions don't fully compensate patentees for the losses incurred as a result of patent delay. The restoration and extensions offered only make up for a small portion of time lost and often come too late.

Patent term extensions are an implicit recognition of one of the main contentions of our report: The remaining term of a patent after grant matters. Until a patent is granted, it remains an uncertain asset on which to base investment and commercialization decisions. The problem is that the innovative subject matter of patents tends to decline in value as time passes. An extension tomorrow is thus often worth much less than a prompt grant today. Perhaps a better system would be one that offered to match the time lost during extended delay periods (whether caused by the patent office or regulatory authority) day for day, after a minimum examination time had passed, ensuring that a patentee is returned to the position he or she would have held if not for the delays and guaranteeing them a patent term equal to any other technology. It would not compensate for the value lost in having exclusivity later rather than sooner, but it would come closer to making the patent applicant whole.

E. Removing Obstacles to Final Grants

Some countries impose requirements beyond examination for obtaining a patent. These requirements can impose substantial delays, and whatever their merits, the harms from delay ought to be considered.

One example of such an obstacle is the pre-grant opposition system in India under Section 25(1) of the Indian Patents Act and Rule 55 of the Indian Patent Rules. Once a patent is published, but before grant, any person may file an opposition. Moreover, a party may file more than one opposition and more than one party may file an opposition. Aside from the delay inherently caused by concurrent and serial oppositions, there are complaints about inefficiencies in the process itself. As an article in Managing IP contends, "the undue delay in opposition proceedings, especially in appointing hearings and giving orders after final hearings, has led to huge delays in granting genuine patents." [64] Such delays motivated countries such as Japan to discontinue pre-grant opposition. Meanwhile, in India, post-grant oppositions, as well as validity challenges in litigation are available. This redundant proceeding is thus adding limited value at the cost of delay.

In Brazil, a convoluted and redundant approval system results in delays for life sciences patents. Certain life sciences patents must be approved not only by the Brazilian patent office (INPI), but also a public health agency known as ANVISA.[65] In 2001, Brazil introduced restrictive and controversial amendments to its IP laws that empowered ANVISA to have the final say on the approval of pharmaceutical patents.[66] This double-checking, or "prior approval" of the work of the patent office has been the focus of much condemnation, with critics arguing that ANVISA is not qualified to examine patent applications or reject patents that have already been approved by INPI.[67] Experts also note an alarming trend that has seen ANVISA intercepting and rejecting applications before they get to the patent office, inverting patent application workflow and denying the patentees review by the proper agency.[68] ANVISA intervention thus adds significantly to patent delay in Brazil. However, as discussed in the next section, despite this procedure and the delays that result, life sciences patents are not subject to the greatest average delays in Brazil.

Whatever the policy goals behind increased pre-grant scrutiny of patents, they must be weighed against the uncertainty and costs caused by delay. Redundant procedures add little value at great cost, and eliminating them could decrease delay.

F. Maintaining Speed and Quality

While speed is laudable, maintaining quality is also important. For example, while China has committed to, and achieved, fast processing of patent applications, critics have accused China of churning out low-quality or "junk" patents.[69] They argue that while Chinese invention patents receive substantive examination prior to grant, less scrutiny is devoted to utility models and design patents.[70] Often these applications are not examined for novelty and may be nearly identical to prior filings, resulting in numerous effectively valueless patents.[71]

In contrast, countries such as the United States and Japan are seen as striking a better balance, providing relatively swift application processing times without sacrificing patent quality. The United States ensures rigorous examination through the Patent Quality Assurance program which uses work product reviews and data-driven quality improvement initiatives to advance USPTO procedures.[72] In 2016, the US also established the Enhanced Patent Quality Initiative to strengthen work products, processes and services and how patent quality is measured "at all stages of the patent process." [73]

In addition to improving patent pendency times significantly over the past decade, the Japanese Patent Office (JPO) has also dedicated itself to improving its patent examination process. Through exhaustive prior art searches and communication with applicants, in addition to oversight by the Quality Management Office, the JPO examiners work to maintain high quality patent standards based on internationally accepted guidelines.[74]

The experience of the U.S. and Japan show that it is possible to focus on both speed and quality in processing patents. (Although it is important to concede that many continue to criticize pendency times in both offices.) Japan's success at significantly reducing examination times while also focusing on quality is an example to follow.

VII. Conclusion and Action Items

The protection of innovative technologies is now more than ever a global concern. As developing countries build and modernize their patent system infrastructure, many are dealing with inefficiencies and delays that render the eventual granted patents all but useless. Extended delay not only affects individual inventors' ability to secure and commercialize the fruits of their labor, but also perpetuates an environment of uncertainty that deters important foreign investments and industries.

Fortunately, some are taking a proactive approach to mounting patent delay and backlog by adopting strategies and programs employed by more established jurisdictions. Countries such as Korea and China have met a massive increase in applications with a dedicated effort to process and grant patents for innovative technologies, and the numbers show they are succeeding. Japan has reduced pendency greatly while also focusing on quality.

Nations' economic strength and progress depend on protecting investments in innovation and creativity. An efficient and capable patent office is a crucial element in guaranteeing these protections. The results of our study show that things are not going well in key parts of the global patent system. For countries suffering from extended and growing pendency periods to turn their patent systems around, a renewed commitment to developing modern and efficient intellectual property procedure is essential to fostering productive innovative economies.

This problem calls for action:

- **It's time for a serious global conversation about patent delay.** While some patent offices are working hard on the problem, it's time to recognize that this is a growing global problem. Unless prompt action is taken, it's likely to get worse before it gets better, given the growing number of applications worldwide. Debates about treaty compliance, measures for reform and harmonization, and hopes for and concerns about the effects of patents start to look beside the point when in many countries the patent system is showing signs of breaking under the strain of applications.

- **Let's recognize that a broken, incompetent patent system is in no one's interest.** It breeds uncertainty and makes business planning difficult. It hurts local entrepreneurs, it delays the introduction of new products, and it costs jobs and other social benefits.

- **Provide greater transparency and more data.** When we began this study, we naively hoped our work would largely be a simple matter of collecting publically available data. That was not the case. While some of the biggest patent systems – e.g., the US and the EPO – provide abundant information on all aspects of pendency, publically available data was scarce in many other jurisdictions. We fear that some patent offices may not be tracking necessary information internally either. Solving the problem requires facing up to the statistics we report here while starting to collect and report on patent office performance universally.

- **Get serious about fixing the problem.** While the design of the patent system raises essential policy issues, the day-to-day work of examining patents is a relatively mundane, technical process. The reluctance of some to share work and information indicates misplaced concerns about sovereignty and policy flexibility. Inefficient patent examination furthers no policy goals but causes much harm. Patent examination should be done well as a simple matter of good governance

- **Start implementing solutions.** There are well-known solutions that more than anything require political will. First and foremost, patent offices need to hire and train more examiners with the right expertise to handle patent applications. They need to become more open to sharing work. They should discuss and try innovative solutions to the common problems raised by patent examination, such as accelerated examination as an incentive to submit streamlined applications. Moreover, any procedure that adds to delay should be subjected to a cost-benefit analysis, particularly if it is a redundant procedure.

VIII. Patent Pendency by Country

This final Section takes a more detailed look at each of the countries in the sample. We identify trends in each country's processing times in general. We also point to the "problem" areas among the industries on which we focused: the life sciences and mobile communications.

A. Brazil

1. Patent Pendency in Brazil in General

Applicants for patents in Brazil experience some of the longest pendency times in the world. As FIGURE 6 shows, the average pendency time to grant for a patent application in Brazil has been steadily increasing over the past eight years, rising from 8.6 years in 2008 to 11.35 in 2015. This is a troubling trend, given that the number of total applications filed per year has hovered around 30,000, which is significantly fewer applications than in other large jurisdictions such as the United States and China.

2. Patent Pendency in Brazil: Trends and Problem Areas

In the five-year period from 2011 to 2015, Brazil saw a significant increase in pendency time for all three of the major technological categories we discuss in our study. As FIGURE 7 indicates, mobile technology and "mature" technology saw pendency periods increase by more than a year from 2011 to 2015, with the pendency time for life sciences increasing by nearly one year.[75]

Brazil's history with pharmaceutical patents has been fraught. One might thus expect life science patents to be Brazil's "problem area" with respect to pendency periods. While they are indeed a problem as discussed in Section III, they are not the worst problem area. In fact, in Brazil, two problem areas were most notable: Digital communications and telecommunications had average pendency periods both approaching 15 years by 2015. Given the vast revolution that has occurred in those fields in recent years, it is certain that Brazilian patents granted in these fields are not only nearly a generation behind the times by ordinary reckoning, but also positively geriatric by tech industry standards.

FIGURE 6 Average Granted Brazilian Application Age (Years)

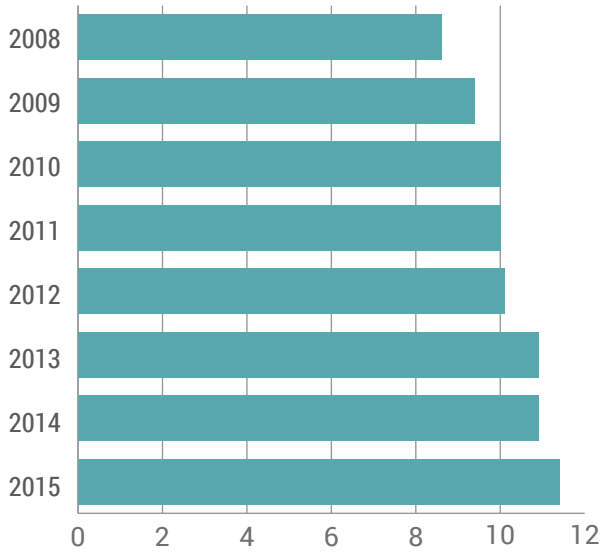


FIGURE 7 Pendency Trends in Brazil: Categorical Comparison

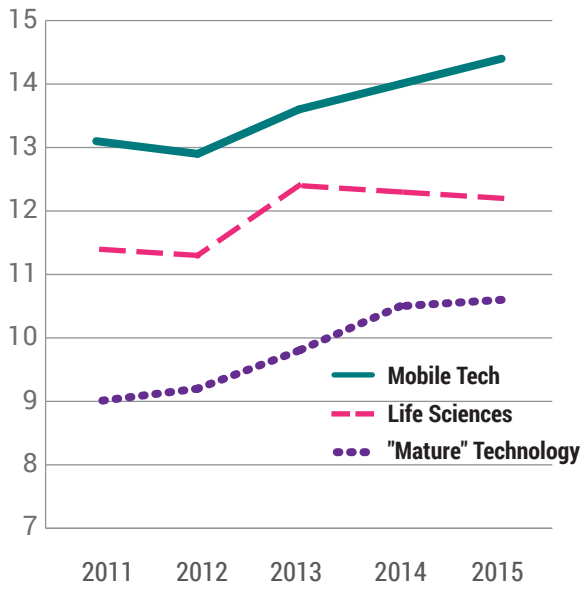
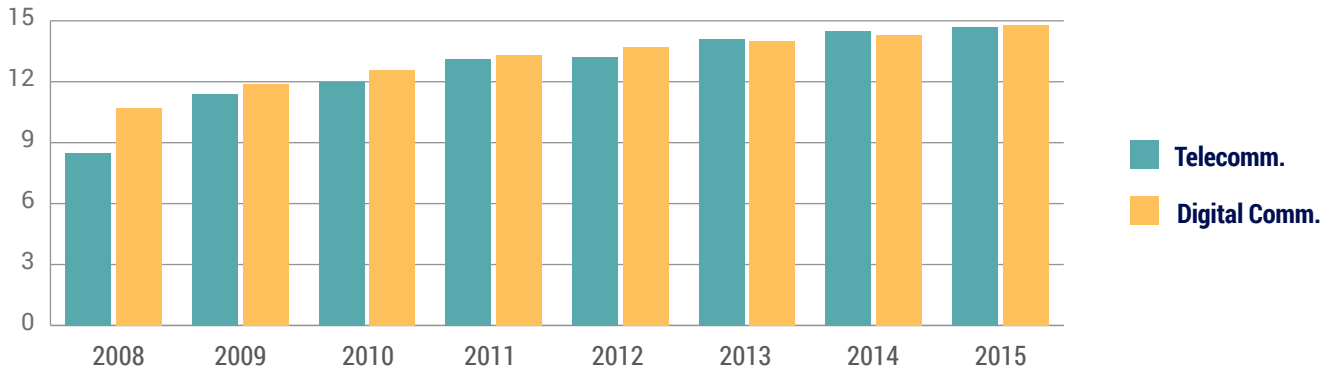


FIGURE 8 Problem Areas in Brazil: Average Application Age (Years)



B. Thailand

1. Patent Pendency in Thailand in General

Thailand is another country in Asia facing a growing patent backlog and lengthy pendency periods. While average pendency times have decreased slightly over the past few years, it still takes almost ten years in Thailand for patent application to be processed and granted.

2. Patent Pendency in Thailand: Trends and Problem Areas

Most of the different industrial classifications follow the same pattern of increasing pendency times that surpassed a decade of pendency in 2011. In the years between 2011 and 2015, the pendency times for many technologies began to gradually decrease, with life sciences representing an outlier that actually increased over that time to over 14 years average pendency in 2015.

FIGURE 9 Average Granted Thai Application Age (Years)

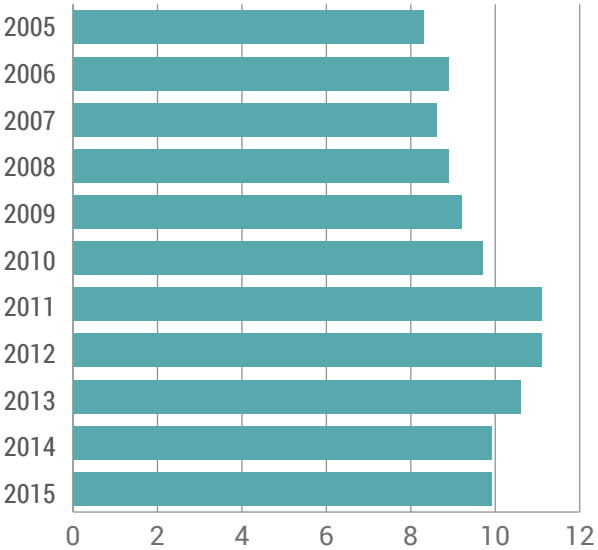
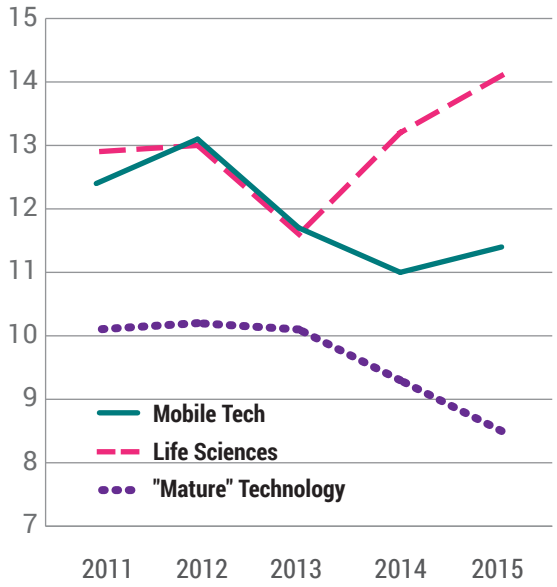


FIGURE 10 Pendency Trends in Thailand Categorical Comparison



One specific problem area in life sciences is pharmaceutical patents, which have seen a continual increase in pendency times topping sixteen years in 2015.

FIGURE 11 Problem Areas in Thailand: Average Granted Pharma Application Age (Years)

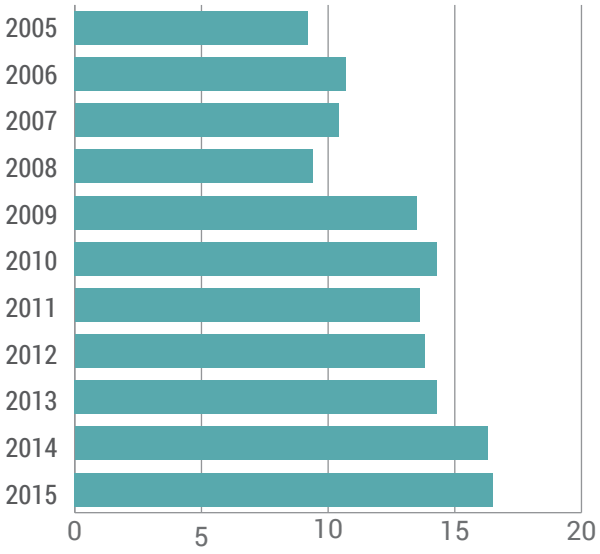
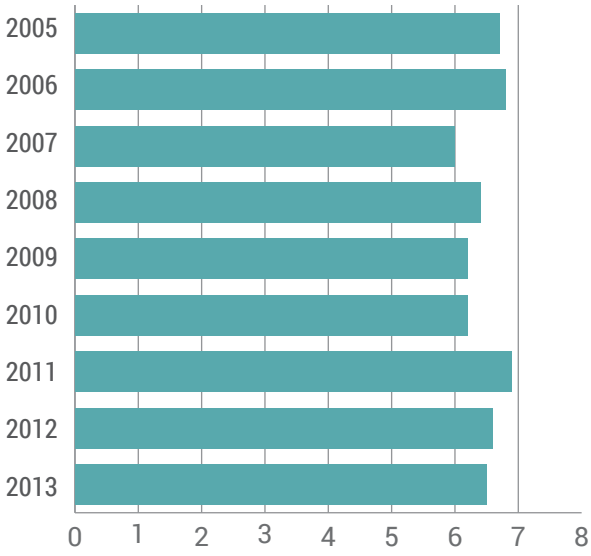


FIGURE 12 Average Granted Argentine Application Age (Years)



2. Patent Pendency in Argentina: Trends and Problem Areas

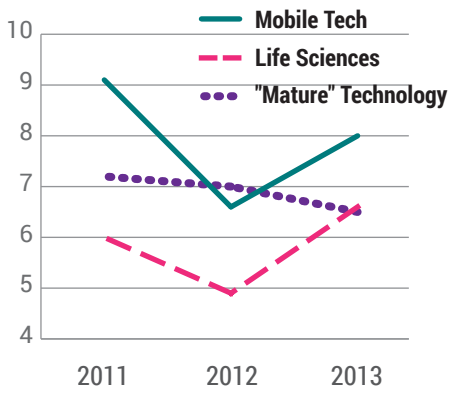
Our data for Argentina was limited to the years up to 2013, and although "mature" technology pendency times gradually decreased in the three years from 2011-2013, FIGURE 13 shows a more erratic trend for life sciences and mobile technologies.

C. Argentina

1. Patent Pendency in Argentina in General

In Argentina, we found an average time of between six and seven years from application to grant. In addition, although patent delay varied over that nine-year span, there is no sign of pendency times consistently improving. FIGURE 12 shows that although pendency time dipped below six years in 2007 to 5.95, it then spiked up to nearly seven years in 2011.

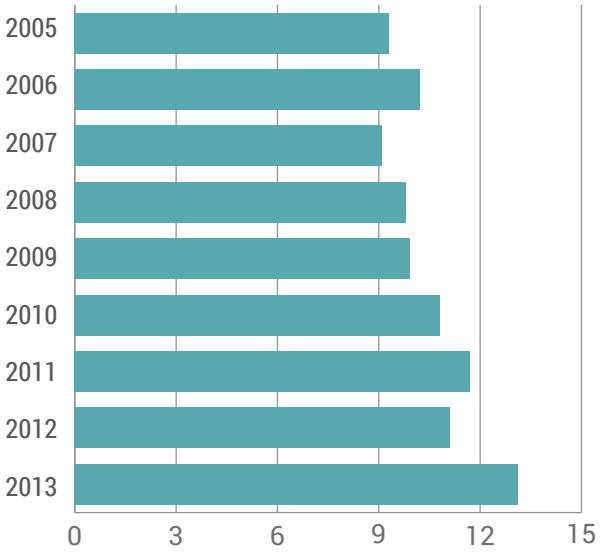
FIGURE 13 Pendency Trends in Argentina Categorical Comparison



When the data was broken down by specific industrial classification, we saw notable delay trends for certain technologies. While some classifications—such as medical technology, pharmaceuticals and telecommunications—experienced pendency times shorter than the six to seven year averages, others were subject to pendency periods of up to and over a decade.

The field of audio-visual technology particularly stood out, with pendency times growing ever-longer over a nine-year span from 2005 - 2013. By 2013, the average time from application to grant for audio-visual technology in Argentina was over thirteen years.

FIGURE 14 Problem Areas in Argentina: Average Granted Audio-Visual Application Age (Years)

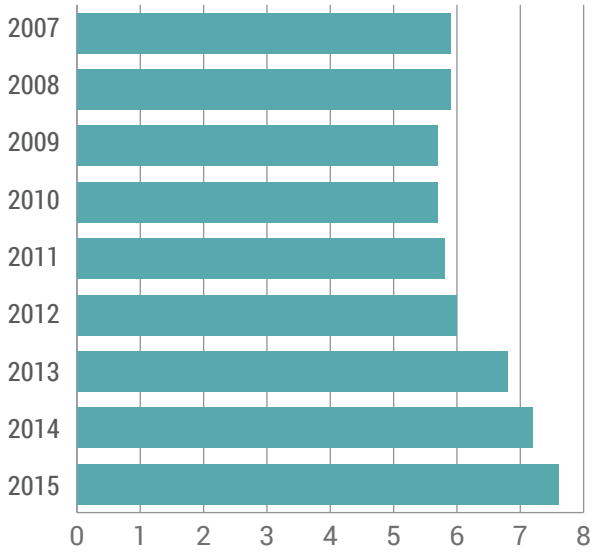


D. India

1. Patent Pendency in India in General

India has experienced extended patent pendency periods in recent years, leading Prime Minister Narendra Modi to call for "an overhaul of the patent application filing process and a drastic reduction in the number of forms required." [76] Despite strategies for expedited application and proposed amendments to the current patent system, India continues to experience pendency periods of six to eight years. Beginning in 2007, the first year for which we had patent grant data, and continuing through 2011, the average pendency times for patents in India held steady at just under six years. But in the past few years, these times have increased incrementally to over seven and a half years in 2015.

FIGURE 15 Average Granted Indian Application Age (Years)



2. Patent Pendency in India: Trends and Problem Areas

Although India has experienced a recent trend of longer patent pendency periods across the board, no single technology stands out as a "problem area" that experiences significantly longer pendency times relative to others. Rather, of the three major technological classifications reviewed, all saw pendency periods increase from around five years in 2007 to between seven and eight years in 2015.

FIGURE 16 Pendency Trends in India Categorical Comparison

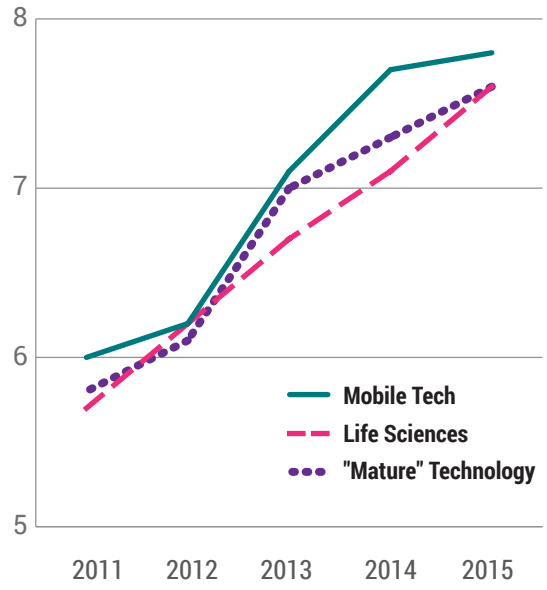
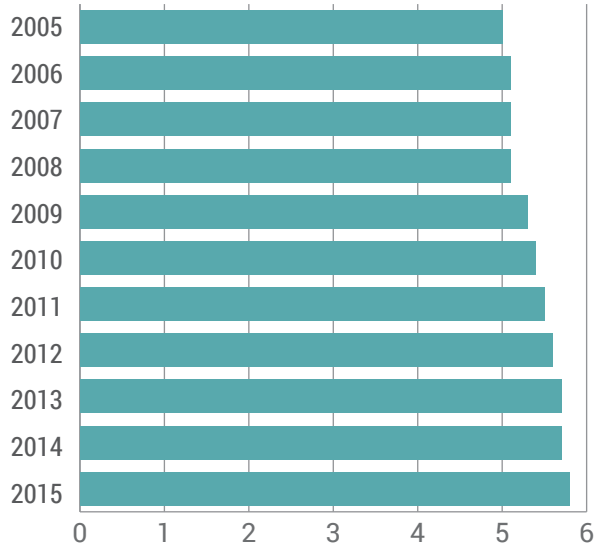


FIGURE 17 Average Granted EPO Application Age (Years)



E. European Patent Office (EPO)

1. Patent Pendency in the EPO in General

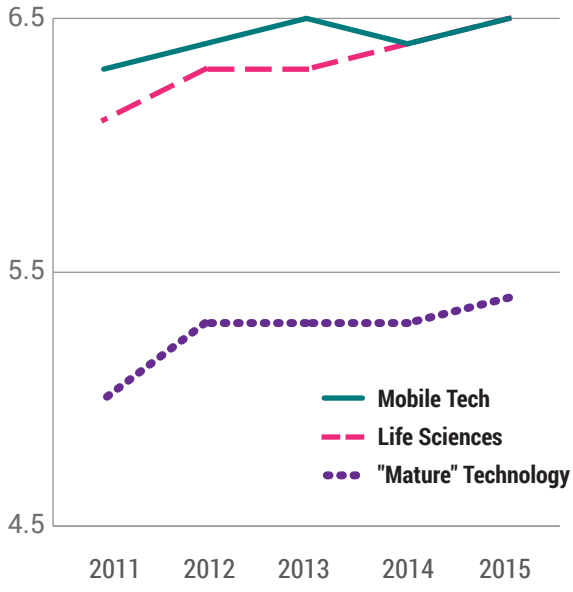
The European Patent Office, the executive arm of the European Patent Organisation, offers inventors a uniform application process that enables them to seek protection in up to 40 European member countries.[77] The EPO was formed in 1977 and grants "European Patents" for their member states, although the resulting patent is not a single patent from the point of view of enforcement.[78] Instead of granting European Community patent or Europe-wide patents, the EPO grants a "bundle of national patents."[79]

Given that the EPO is nearly 40 years old and is included—along with the USPTO, the JPO, the Korean Intellectual Property Office (KIPO) and the State Intellectual Property Office of China (SIPO)—in the co-operative organization known as the IP5, it is somewhat surprising that the Office experiences lengthy pendency periods comparable to some of the developing countries discussed in this report. Our research found that the average time from application to grant has been increasing steadily over the past eleven years, rising from five years to nearly six.

2. Patent Pendency in the EPO: Trends and Problem Areas

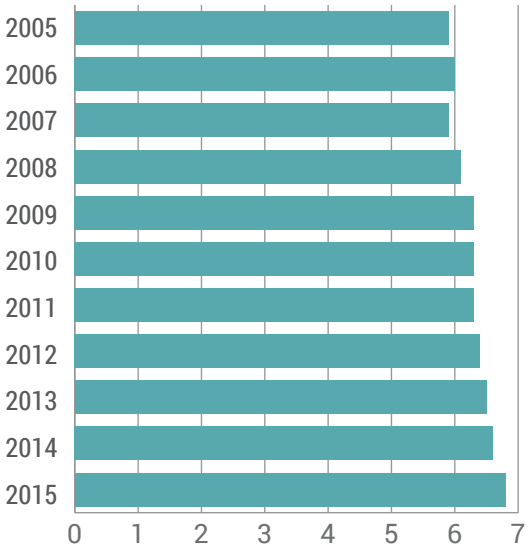
The EPO's pendency periods of between five and six years remain relatively consistent across the technological categories we studied, with no extreme outliers or relative problem areas. The five-year trend from 2011 to 2015 saw a gradual rise in all three of our major categories, with life sciences and mobile tech experiencing delays about a year longer than "mature" technology.

FIGURE 18 Pendency Trends in the EPO Categorical Comparison



One slight deviation was pharmaceutical patent pendency periods, which have risen consistently over the past decade to reach just under seven years in 2015.

FIGURE 19 Problem Areas at the EPO: Average Granted Pharma Application Age (Years)

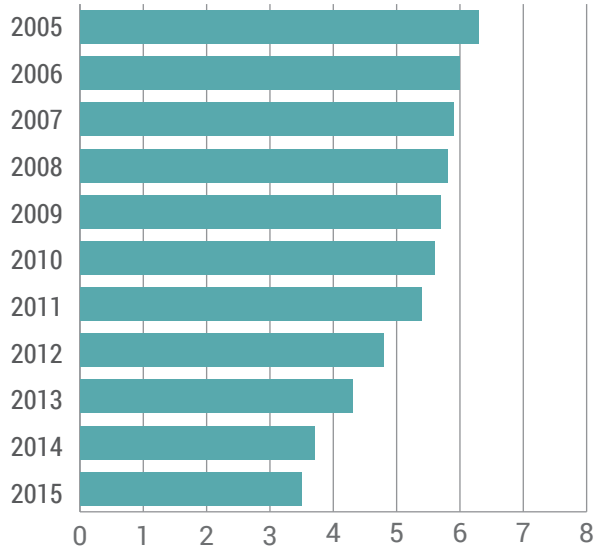


F. Japan

1. Patent Pendency in Japan in General

Japan stands out as bucking the trend. While other patent offices improved slightly or got much worse, the Japanese Patent Office (JPO), which has set the goal to become "the World's Fastest and Utmost Quality in Patent Examination," has successfully decreased pendency times in the face of mounting applications over the past eleven years.[80] Although pendency times were stuck at more than six years from 2005 to 2011, over the past four years the JPO has dramatically decreased those numbers to 3.34 years in 2015.

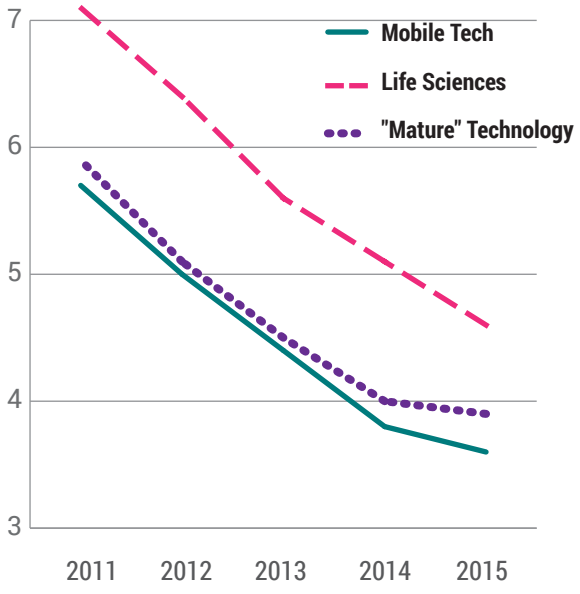
FIGURE 20 Average Granted JPO Application Age (Years)



2. Patent Pendency in Japan: Trends and Problem Areas

As FIGURE 21 demonstrates, there has been a significant downward trend in pendency times in the five-year period between 2011 and 2015. The major categories of "mature" technology and mobile technology follow a very similar course from almost six years pendency in 2011 to less than four in 2015, while life sciences dropped from more than seven years to less than five.

FIGURE 21 Pendency Trends in Japan Categorical Comparison



While all of Japan's technological categories have experienced significantly decreased pendency periods over the last decade, pharmaceutical and biotech patent applications still have an average pendency time of almost five years. This may be a holdover effect from ten years ago, when these technologies experienced pendency periods of almost eight years, while other technologies hovered between five and seven years.

FIGURE 22 Pharmaceutical Patent Application Pendencies in Japan: Average Granted Pharma Application Age (Years)

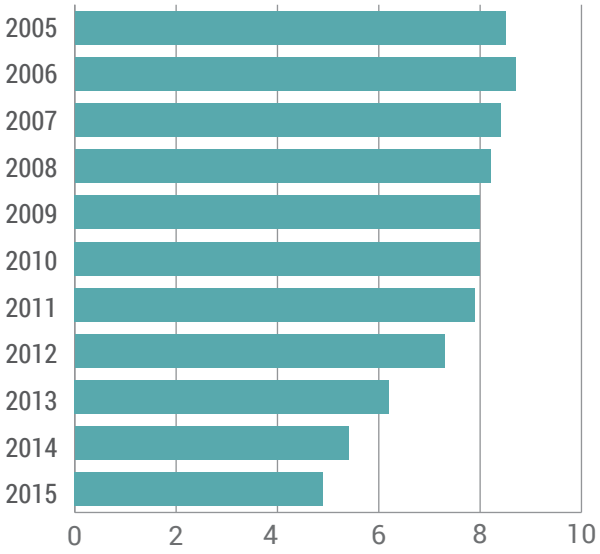
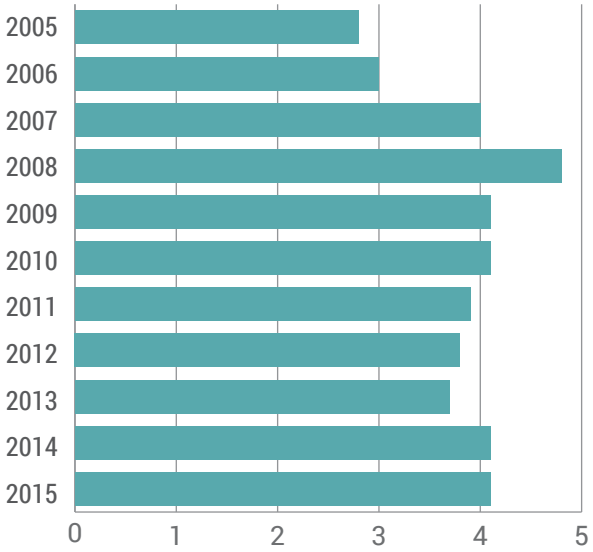


FIGURE 23 Average Granted Egyptian Application Age (Years)



2. Patent Pendency in Egypt: Trends and Problem Areas

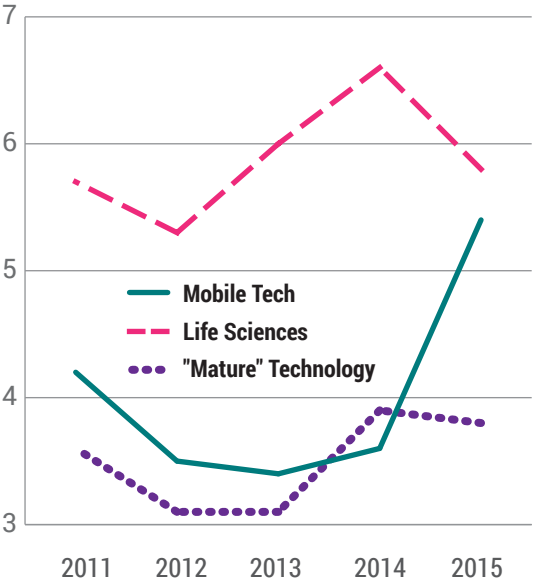
Trends for the three major categories in Egypt have been more erratic than some of the other countries reviewed, possibly as a result of a much smaller number of patents being granted on a yearly basis. While averages fluctuated between the years of 2011 and 2015, the pendency periods for "mature" technology, mobile technology, and life sciences were all longer by 2015 than they were in 2011.

G. Egypt

1. Patent Pendency in Egypt in General

Pendency times in Egypt fluctuated over the past eleven years, experiencing a low of less than three years in 2005. These average pendency times then shot up to nearly five years in 2008, followed by a gradual decrease before rising again to just over four years in 2015. If nothing else, however, Egypt's record indicates that even a developing country weathering historical challenges can have some success with processing patent applications.

FIGURE 24 Pendency Trends in Egypt Categorical Comparison



In Egypt, pharmaceutical patent applications have experienced the longest average pendency times, recently varying between seven and ten years. This lengthy delay is likely a result of Egypt not recognizing product patent protection for pharmaceuticals until 2005 and its slow adoption of other pharmaceutical TRIPS requirements.[81]

FIGURE 25 Problem Areas in Egypt: Average Granted Pharma Application Age (Years)

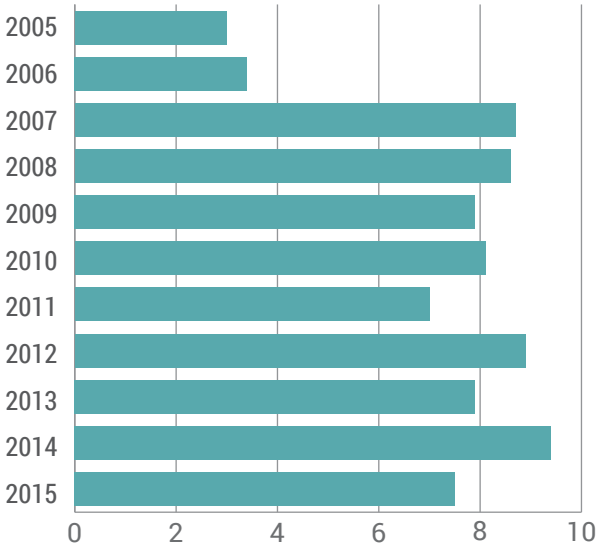
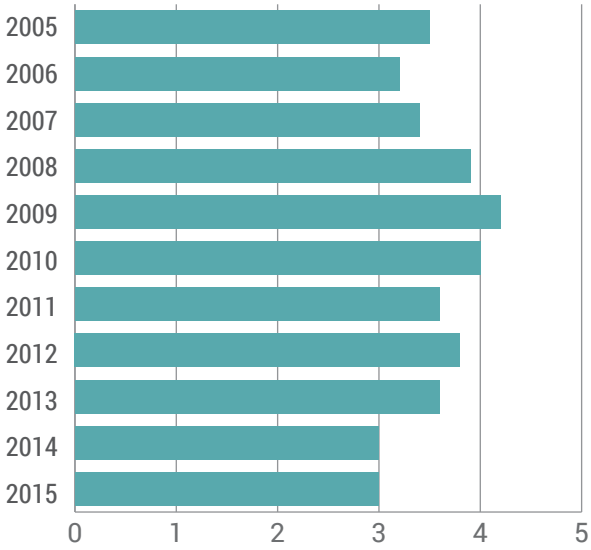


FIGURE 26 Average Granted Australian Application Age (Years)



2. Patent Pendency in Australia: Trends and Problem Areas

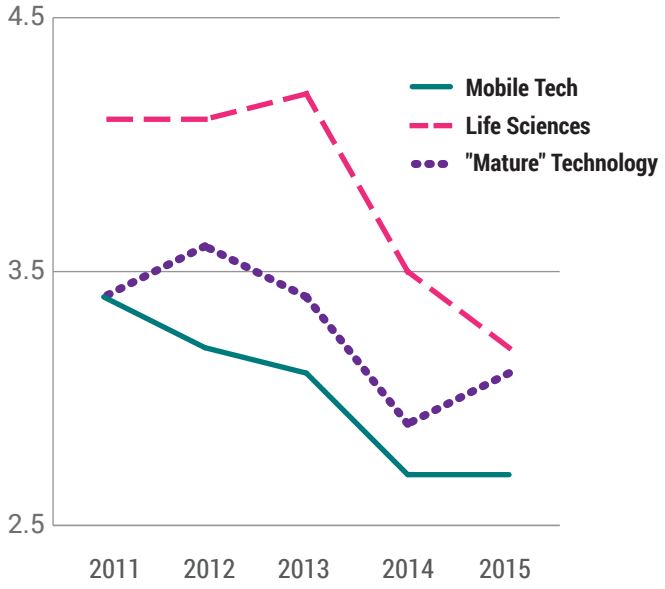
Pendency periods for the three major technological categories have decreased from 2011 to 2015, with mobile technology leading the way and falling to less than three years pendency by 2015.

H. Australia

1. Patent Pendency in Australia in General

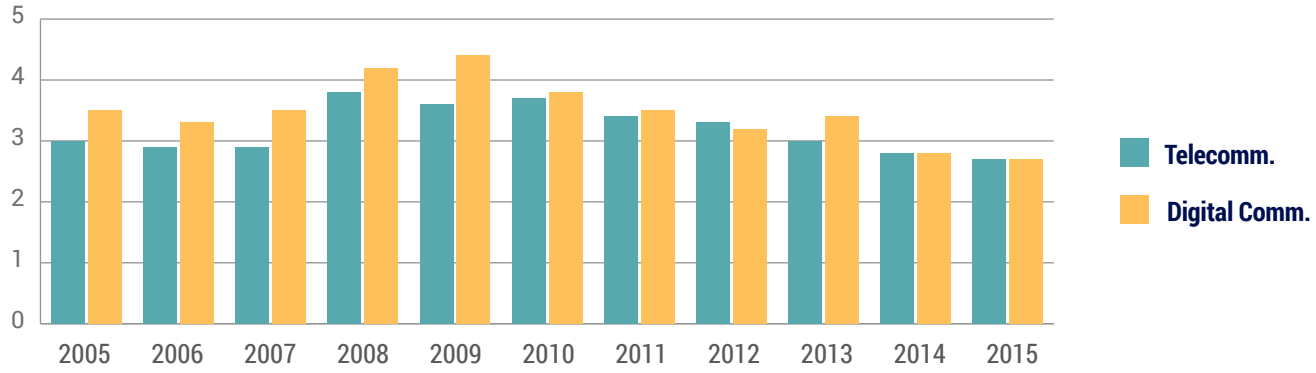
Australia has been a consistent success story in the face of an increasing application volume. Australia experienced an average annual patent application growth rate of about three percent over the past five years, rising 10% in 2015 to 28,605.[82] In 2009, pendency averages peaked at just over four years, but have fallen almost every year since then, dropping to just under three years in 2015.

FIGURE 27 Pendency Trends in Australia Categorical Comparison



Like the EPO and India, Australia does not have any significant relative technological problem areas.

FIGURE 28 Industrial Trends in Australia: Average Granted Application Age (Years) - Telecomm. and Digital Comm.



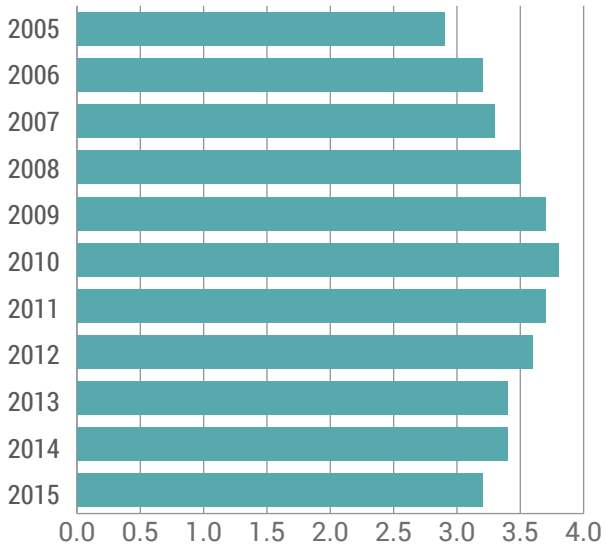
I. The United States

1. Patent Pendency in the United States in General

The United States Patent and Trademark Office (USPTO) is often criticized for its large and expanding backlog of applications, and what is perceived as a bottleneck exacerbated by sluggish processing times. However, in relative terms, the USPTO is quite successful. Dissatisfaction with even the USPTO's efforts speaks volumes about how poorly patent offices with much longer pendency periods are serving innovators.

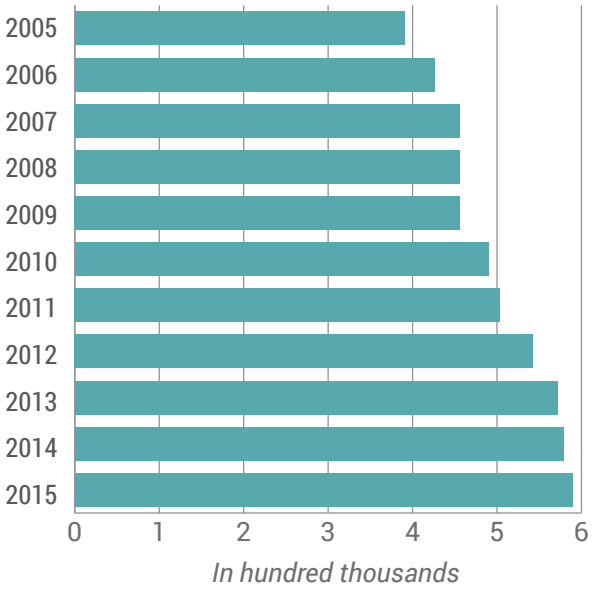
Despite criticism, the USPTO is consistently among the most proficient patent offices in the world, with pendency times hovering around three years over the past decade, and improving in recent years. In 2005, the USPTO received a total of 390,773 utility patent applications and granted just under150,000 utility patents.[83] Of the total granted in 2005, the average time the applications had been pending was 2.94 years.

FIGURE 29 Average Granted USPTO Application Age (Years)



As seen in FIGURE 30, the average pendency time increased gradually from 2005 to 2010, before falling back to 3.19 in 2015. Over that eleven year span, applications continued to increase at the USPTO, reaching 589,410 in 2015.[84]

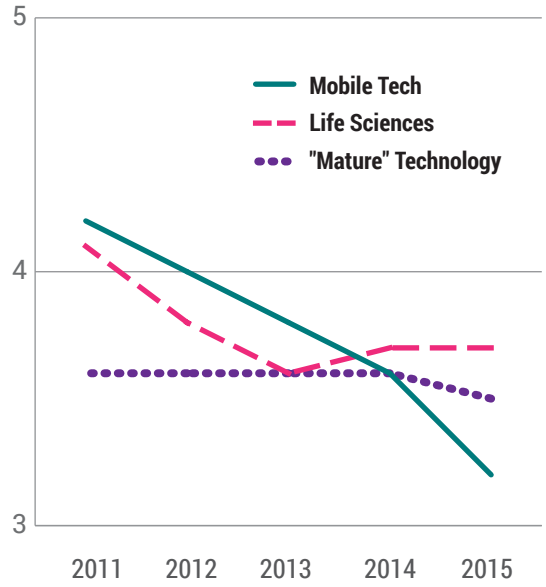
FIGURE 30 Total Number of USPTO Applications



2. Patent Pendency in the United States: Trends and Problem Areas

The United States has seen pendency time decrease in the three major categories examined in this study from the years 2011-2015. As seen in FIGURE 31, "mature" technology has experienced a gradual shortening of pendency times, while mobile technology pendency has decreased by almost a year.

FIGURE 31 Pendency Trends in the United States Categorical Comparison



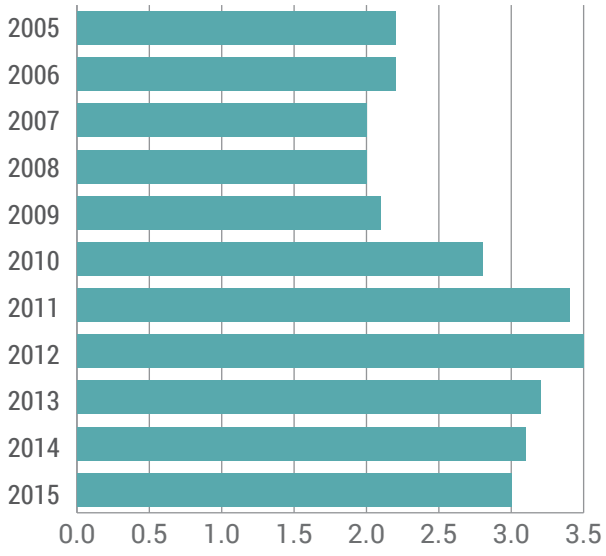
The United States does not currently experience significantly longer delay periods in any specific technological category.

J. China

3. Patent Pendency in China in General

In 2014, application activity in China outpaced the combined total of the next two jurisdictions, the United States and Japan.[85] China saw 928,177 applications filed in 2014, a growth of 12.5% from the year before, and applications are expected to top one million for 2015.[86] Despite this unparalleled influx of applications, China's average pendency time from application to grant is comparable to the most efficient patent offices in the world, regularly coming in around three years. Even facing double-digit applications growth rates, SIPO's average pendency time has decreased in recent years.

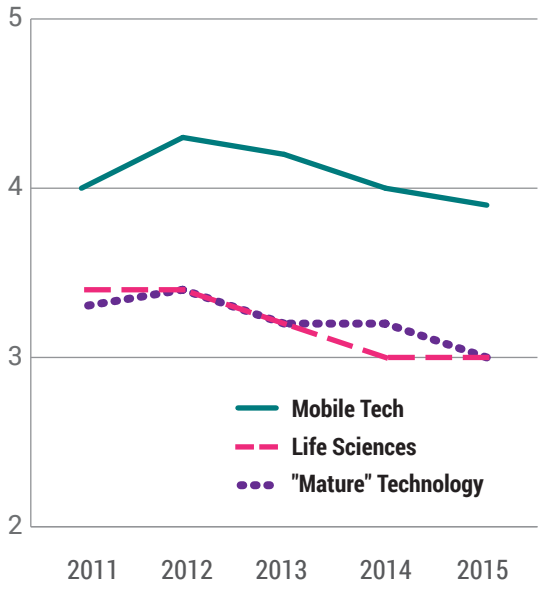
FIGURE 32 Average Granted Chinese Application Age (Years)



4. Patent Pendency in China: Trends and Problem Areas

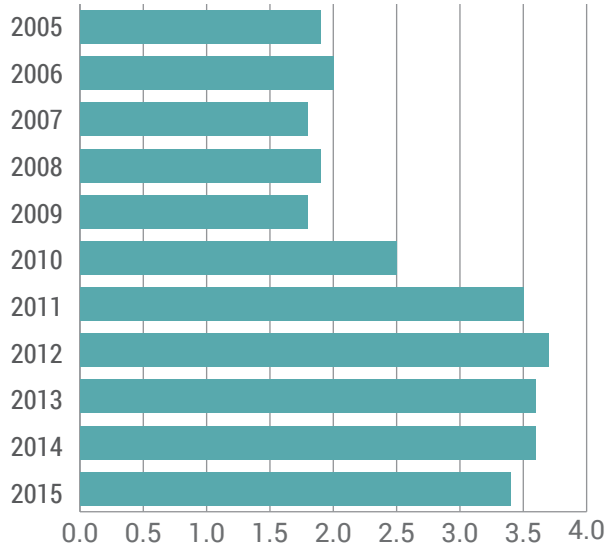
As FIGURE 33 demonstrates, China has experienced relatively gradual decreases in pendency times for the "mature" technology, mobile technology, and life sciences categories in the five-year period between 2011 and 2015. Pendency periods for life sciences and "mature" technology trend about a year shorter than mobile technology.

FIGURE 33 **Pendency Trends in China Categorical Comparison**



China does not have any specific technological categories that stand out with significantly longer patent pendency periods. However it's worth noting that pendency times for some technologies have risen slightly over the past decade. While pharmaceutical and biotech applications have seen a drop from almost four years pendency to less than three over the past ten years, every other category saw pendency time increase, with medical technology and engines, pumps and turbines pendency times increasing by over a year.

FIGURE 34 **Problem Areas in China: Average Granted Engines (Pumps, and Turbines) Application Age (Years)**

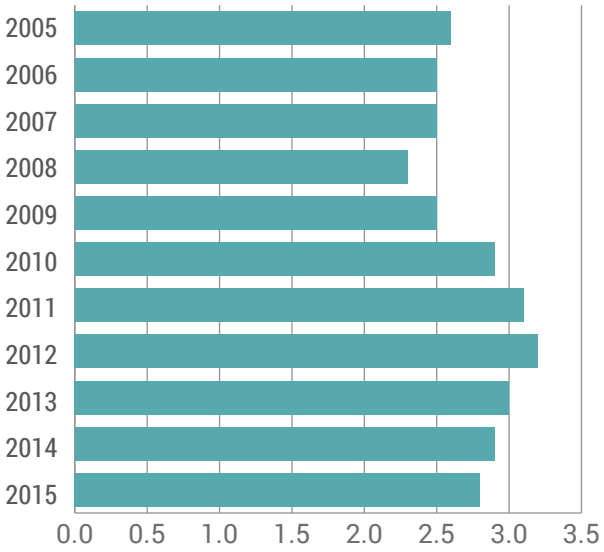


K. Korea

1. Patent Pendency in Korea in General

Korea has consistently achieved some of the shortest pendency periods in the world over the last ten years, on par with or better than the U.S., China and Japan. But whereas Japan has been successful in continually decreasing formerly long pendency times, Korea has maintained relatively swift processing over that time, varying only marginally from 2.56 years in 2005 to 2.75 in 2015. This efficiency was maintained even as applications steadily rose from 359,207 in 2005, to 434,047 in 2015.[87]

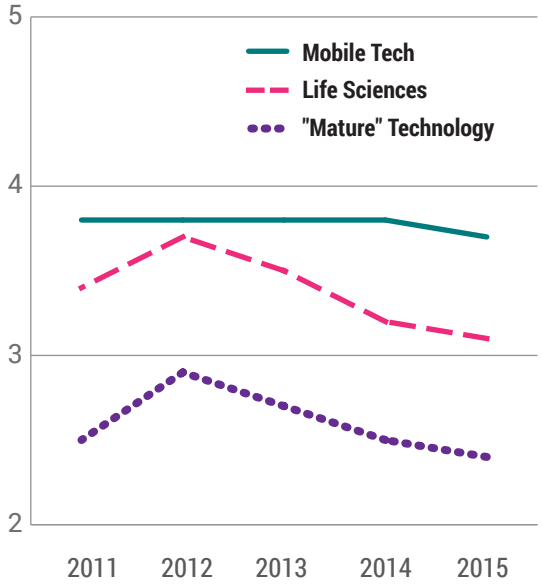
FIGURE 35 Average Granted Korean Application Age (Years)



2. Patent Pendency in Korea: Trends and Problem Areas

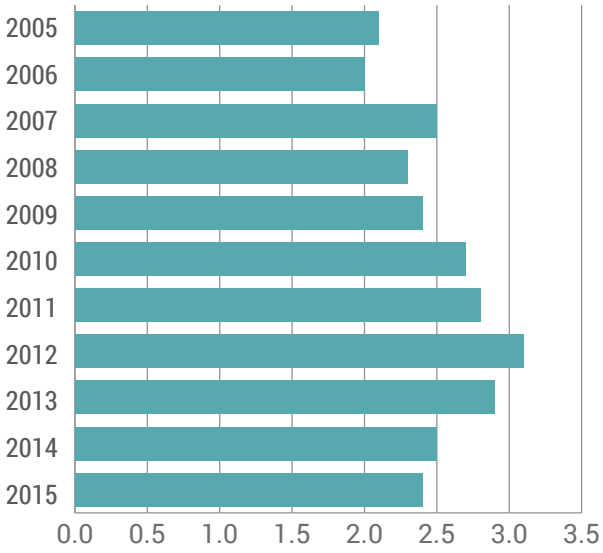
Mobile technology, life sciences, and "mature" technology have all experienced a gradual drop in pendency time from 2011 to 2015, with "mature" technology leading the way at less than two and a half years. Life sciences and "mature" technology followed a very similar five-year path, with mobile technology experiencing more gradual variations.

FIGURE 36 Pendency Trends in Korea Categorical Comparison



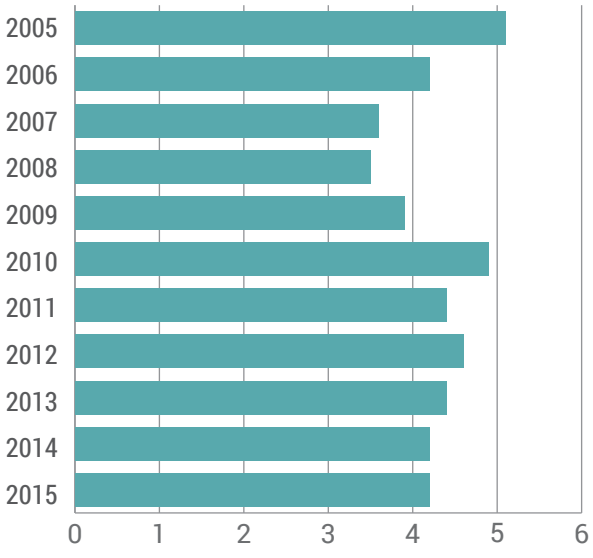
While Korea has sustained an efficient patent prosecution system over the last ten year and hasn't experienced any problematic technological categories, there are some anomalies worth mentioning. Like China, Korea has seen a small increase in pendency times over the last decade in for certain categories such as medical and audio-visual technology.

FIGURE 37 Average Granted Medical Tech Application - Korea



Also worth noting is that while pendency averages hover between two and three years for most categories, pharmaceutical applications have sustained a pendency time of over four years for most of the past decade.

FIGURE 38 Average Granted Pharma Application Age – Korea



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    Although the Orbit portal is far-reaching in its collection of patent data, there are still certain countries for which it does not have information on patent grant date. For detailed information on patent grant dates in Argentina, we consulted the hard copy quarterly publications of the Argentinian National Institute of Industrial Property ("INPI"). INPI publishes a quarterly register of all patents granted on the INPI website for the years 2001 through 2013. National Industrial Property Institute of Argentina, http://www.inpi.gov.ar/index.php?Id=290&criterio=2 (last visited June 20, 2016). We gathered a random sample of 100 granted patents for each year and hand-coded the application numbers into the Orbit database to obtain data. Because INPI only provides the reports through 2013, our data includes only the nine years from 2005 to 2013.

90. UKIPO-USPTO Report at 17. The US system includes a so-called "Final Rejection," but it is not truly final. Between 2001 – 2005 nearly 58% of all US patent applications endured a "Final Rejection," but the vast majority of those applications eventually resulted in an issued patent. Id. at 114.

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Appendix 1

Measuring Patent Pendency

This White Paper measures patent pendency by calculating average time to grant for patents issued each year. There were two motivations for using this measure: data availability and the fact that it provides a useful summary measure of patent pendency. This Appendix details how we collected our data, describes other approaches to measuring patent pendency, and describes limitation and further areas for research.

Data Collection for this Study

To collect data on patent pendency, we used the web-based, patent search software Orbit IP, a product of Questel.[88] We found the Orbit portal to be one of the more comprehensive and user-friendly patent search tools that provided us with patent grant dates, a statistic that surprisingly is not always provided by other patent search portals.[89]

The number of granted applications varies greatly among countries. For example, our queries for India and Australia resulted in datasets of many thousands of granted patents per year, while the same queries for Egypt and Thailand returned a few hundred. Although there was a disparity in the total number of granted patents for different countries, we are confident that even the smaller datasets contain enough patents to provide a useful average for the purpose of our study.

Limitations and Scope for Further Research

While our focus on average time to grant is well-justified, there is wide scope for further research and some potential limitations to our initial analysis of the problem.

First, we focused on average time to grant rather than any final disposition—a broader category that would include a rejection or abandonment. One very well might want to measure the time it takes to obtain *any* final disposition of an application, whether positive or negative. Unfortunately, this data is sometimes impracticable to obtain. Some patent offices, notably among them the US and UK, do not issue a *true* final rejection. Rather, the terminal state in such countries is either an issuance of a patent or an abandonment of the application.[90]

Datasets for many countries thus lack a clearly defined terminal rejection point. In such instances, abandonment could serve as a proxy for the rejection of a patent application, but using it likely causes the measure to understate pendency periods. First, it is problematic because it deflates the average downward by giving "credit" to a patent office for some applications that it did not fully process. More important, processing delays are themselves a likely driver of abandonment. Logically, as the time it takes to get a patent increases, applicants become more likely to give up – as the potential patent becomes less relevant, companies go out of business, or inventors pass away.[91] For these reasons, this White Paper focuses on an applicant's best-case scenario – the time it takes, on average, to obtain a patent grant.

Second, this report examines average "exit pendency"—the average time to grant for patents *granted* in a particular year. In some instances a patent applicant might be more interested in "entry pendency"—the average time to grant for patent applications *filed* in a particular year. After all, a current applicant is most interested in how well the patent office is processing recent applications, as that could be a good indicator of how long it will take to process their new application. By contrast, average exit pendency could be skewed upward by clearing out backlogs of older applications. The difficulty with calculating entry pendency is that there is necessarily a delay – one must wait until the applications filed in a given year are processed. While this lagging indicator can nevertheless be useful in countries where processing times are a matter of a few years or less, the lengthy delays in some of the countries studied here makes it impractical to calculate and somewhat irrelevant. In such instances, current applicants probably do not need to know how promptly the office is processing filings from recent years, since lengthy average exit pendency times tell them that they should likely expect a long wait.

Third, a further related issue is that focus on clearing particular sets of applications can affect average processing times. A concerted effort to clear out old applications would tend to raise the average exit pendency time for a period – such is what happened to statistics for the UKIPO and USPTO. On the other hand, a patent office trying to improve statistics could take a "first in first out" approach, which would reduce the average pendency for a while at least, while still other averages might vary for a variety of idiosyncratic reasons. While these concerns are real, the best one can do is take averages over a period of years and focus on trends.

Fourth and finally, it is important to note that the applicant is responsible for some portion of patent pendency. Applicants have control over a number of choices in any given patent system, including, in many cases, requesting an initial search, responding to office actions, making amendments, and so on. The applicant may delay for strategic reasons or due to his or her own lack of diligence. While this issue is real, it likely is of greater importance to jurisdictions where the patent office seeks to shave months off pendency. Where we see delays of many years, far out of line with other jurisdictions, then applicant delay would appear to be a lesser issue.

In the end, while much can be learned from collecting a variety of statistics on patent pendency, one must first apprehend the scope of the problem in broad terms. That is what we do for the first time here with respect to the global nature of the issue. We plan to further study the issue in later work.

Measuring Patent Backlogs

This White Paper considers solely the average "pendency to grant time" for patents in a sample of countries for a span of years and set of industries. Average pendency to grant time is not the only metric one might wish to capture, since the problem of delays in processing patents is multifaceted. Other statistics are illuminating for a variety purposes.

The most thorough examination of the issue to date was provided in a joint report by the USPTO and UKIPO released in 2013, "Patent Backlogs, Inventories, and Pendency: An International Framework,"* (UKIPO-USPTO Report). The Report considered several potential labels and metrics describing challenges with processing patents. First, the Report observed that the commonly used term "patent backlog" is too poorly defined to be helpful. For some, "backlog" refers only to unexamined applications, to others it refers to all pending applications, and to still others it means the amount of applications greater than some arbitrary limit (for example the number of applications aged beyond a certain period, or inventory above a certain number).

The UKIPO-USPTO Report instead used measures of patent office inventory and pendency. The inventory measures tally the stock of patents at a given time with a particular status:

- Received, but not yet ready for examination
- Ready for examination, but without first examination completed
- Received first examination, but still pending final disposition (grant or abandonment)

The pendency measures determined:

- Exit pendency – the time to terminal disposal, most likely final grant or abandonment, for all applications disposed of in a particular timeframe
- Entry pendency – the time to terminal disposal for all applications filed at a particular time
- Expected pendency – the expected time to terminal disposal for an application filed at a particular date, predicted using survival time regressions

The UKIPO-USPTO Report advocates these measures as useful for cross-country comparisons. They are indeed best practices for benchmarking the performance of patent office operations. However, this level of detail is only possible if the data is available and is most necessary if seeking to reform a patent office's operations. As we explain in the accompanying text, our measure is confined to pendency to grant time due to the data we could get and the more modest goals of this White Paper.

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* Mitra-Kahn, B., Marco, A., et al., 2013, "Patent backlogs, inventories, and pendency: An international framework," IPO- & USPTO joint report, http:// www.ipo.gov.uk/pro-ipresearch.htm.