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Testimony

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On The Rise of Innovative Business Models: Content Delivery Methods in the
Digital Age

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Chairman Coble, Ranking Member Watt, and distinguished members of the committee. My name is Sebastian Holst and I have worked in the world of software and digital publishing for over 20 years.

Like many in today's "digital age," I am actively working in a number of different ventures – as a creator of content, software, and tools that help organizations large and small secure their own software, content, and embedded intellectual property.

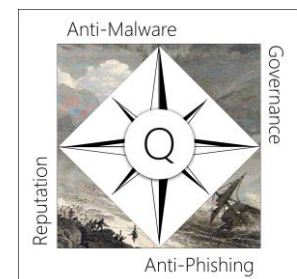
I am the Chief Strategy Officer at PreEmptive Solutions, a company that protects software against reverse engineering, piracy, and tampering as well as monitoring production application usage to help improve application quality, user experience, and – ultimately – application value. Our clients include the manufacturers, financial institutions, healthcare providers, and – of course – software development companies. Over the past 8 years, I have worked closely with our 5,000+ clients to develop a deep understanding of their aspirations and their fears – aspirations and fears that are influenced in equal measure by new business opportunities, competitive forces, technology revolutions, cyber-threats, and regulatory obligations.



I am also a co-founder of TheMobileYogi. Along with my wife, Dawn, and another developer, David Poeschl, we develop mobile apps for consumers and small businesses – specifically, we publish yoga content (written instruction, images, video, and audio) dynamically delivered through apps across mobile devices (iOS, Android, and Windows Phone) and multiple marketplaces (iTunes, Google Play, Amazon, and Microsoft). In order to reach our target markets (individual yogis, yoga studios, and wellness organizations inside larger corporations) and monetize our work, we provide free apps with upgrades, in-app advertising, rebranding of our apps for our business clients, and other more nuanced business models only possible through the unique mix of mobile technology, online marketplaces, and software. Yet, at our core, we are publishing business; delivering content wrapped inside easy to use applications. Today, we have over 150,000 users and, perhaps as a consequence of delivering quality content, we have also had our content pirated; we have not only lost revenue, we have to compete against ourselves.



I also founded Qi-fense, a company that provides detective anti-phishing controls, data mining, and competitive intelligence through real-time analysis of phishing and spam campaigns. Today, this service is actively used by financial institutions, other cyber security firms, government agencies, and law enforcement. In this capacity, I see on a daily basis how trusted brands are hijacked and exploited to commit a broad spectrum of fraud targeting both consumers and businesses alike.



In addition, I am here today as a member the Association for Competitive Technology (ACT). ACT is a trade association which represents small and medium size software developers like me. Founded in 1998 by software developers, ACT supports app developers and innovative small business around the world. ACT has helped developers like me navigate law and government regulation and advocates for developers at all levels of government. I am one of thousands of developer members who have benefited from ACT's hard work and resources.

How Content Has Changed

The evolution of content delivery business models can be linked directly to the evolution of content itself. Business opportunities (and the potential for exploitation) have evolved in lock step with the expansion of what we mean by "content."

While we may call them by different names, writers, designers, and developers are all content authors and so it should come as no surprise that innovation is also occurring across (not just within) each of these categories as well.

How Content Delivery Business Models Have Changed

While the model for conveying digital content has changed considerably in recent years, the common threads have been discoverability, delivery, and payment. Each element has its own challenges still today, but overall, the new mobile app economy has significantly altered the barriers to entry faced by independent authors and software vendors.

For decades, the only way for a consumer to get any kind of content (books, movies, software, etc.) was to walk into a store and buy it in a box or case, or order by mail through a catalog. While on its face that process was relatively simple for the consumer, for the content author this model was costly, time consuming, and limiting.

For example, to get that box of software to the consumer, developers would have to find a publisher, pay for boxes, printing, physical disks, manuals, and shipping. Then, if developers wanted consumers to actually see the software, they had to pay the store for space in the Sunday flyer or catalog. Additionally, floor space in the actual store cost money -- to be featured on the end of a row, commonly called an end cap display, is "paid" space, not merely space that the stockroom decided how to use.

Factoring in all these expenses, the cost of putting software on the shelf could at times dwarf its initial development costs. Of the \$50.00 purchased price at Circuit City, a developer might only see \$7.00. These costs posed significant barriers to entry and proved insurmountable for many small publishers.

Then came the internet. Suddenly developers no longer had to pay for boxes. A developer could create a website, build a server system, pay for bandwidth, and have a virtual store. This change was life-altering when it came to delivery. The one-person shop could

theoretically have the same access to customers as the largest companies who previously owned the floor space and Sunday flyers.

But it turned out that setting up your own website could be very lonely. If no one knew about the software, it didn't matter how quickly it reached the hands of the consumer. As discoverability persisted as a significant hurdle, search engine optimization (SEO) became a new cost for the developer in which the opacity of search engines was often confounding and frustrating.

Managing financial transactions proved another challenge. Acting as their own storefront, individual developers had to set up mechanisms to collect payment and manage credit-card data over the internet. If a box was still shipped, significant personal information was now collected and managed by the developer. Barriers had been lowered, but it was not perfect.

Fast forward to the advent of first the iTunes store, and then the Windows Mobile, Google Play, and Amazon storefronts. These stores handled our three key issues differently:

- **Delivery** - Where developers once had to rely on shelf space or individual websites, app stores now had a mechanism to deliver apps directly to the consumer. Further, mobile platforms offered a single point of sales – curated stores – which provided consumers a trusted place to find apps.
- **Discoverability** - Always difficult for small companies, mobile stores made it significantly easier for consumers to find our products. Developers no longer needed to worry about shelf space or getting lost in the wild west of the internet.
- **How You Get Paid** - Developers no longer had to figure out how to monetize their software, as the stores themselves handled the payment processing. With payments managed by the store, the developer could be free to concentrate improving and updating apps.

These changes made it easier for everyone to deliver their digital content to a wide audience. Ironically, however, the success of app stores has re-introduced some of the "discoverability" problems we faced in the past. With more than a million apps in the App Store, consumers have so many choices it can be difficult to identify what best suits them. Search engine optimization and paid promotions once again are becoming critical.

How and Where Developers Make Money

With the improvement of content delivery through app stores, the app economy has seen a meteoric rise. Just two years ago, total app industry revenues were \$3.8 billion and expected to rise to \$8.3 billion. However, by the end of last year we already reached \$20 billion and are now projected to reach \$140 billion by 2016.

With the growth of the app economy has come a growth in jobs. In December 2011, Michael Mandel determined that 466,000 jobs had been created in the app marketplace.¹ His July 2013 study has seen that figure rise above 750,000.² 73% of apps ranked top ten in their category are made by small companies and 65% of the most successful app companies are now hiring.³ The growth is not limited to the US; a study from ACT last month showed that the apps economy has created over 800,000 jobs in Europe.⁴

For app developers, we have learned that not all app markets are created equal. To date, developers make nearly 11 times more money on applications sold through "curated" stores. These are storefronts where the applications shown to the user have either been vetted, or have had to meet fairly stringent guidelines. These "curated" stores are exemplified by Apple, Microsoft and Amazon's various stores.

Other apps are available with less review or constraint - interestingly, developers have not found these "wild west" marketplaces to be as profitable.⁵ Moreover, recent studies, including one by Lookout, show that the less curated markets have more piracy, and are more dangerous for consumers in terms of malware and other deceptive practices.⁶

Developers and marketplaces continue to innovate and consumers have embraced a number of models that are unique to the app economy. These include:

- **Advertising-funded applications:** full function apps that are free to use but include advertising (akin to broadcast television).
- **Freemium applications:** apps with reduced functionality or time-limited access at no cost but the user can upgrade to the full-function <https://www.lookout.com/resources/reports/state-of-mobile-security-2012> version.

¹ Michael Mandel, "Where the Jobs Are: The App Economy," TechNet (February 7, 2012), *available at* <http://www.technet.org/wp-content/uploads/2012/02/TechNet-App-Economy-Jobs-Study.pdf>

² Michael Mandel, "752,000 App Economy jobs on the 5th anniversary of the App Store," Progressive Policy Institute (July 8, 2013), *available at* <http://www.progressivepolicy.org/2013/07/752000-app-economy-jobs-on-the-5th-anniversary-of-the-app-store/>.

³ "The App Store After Five Years: What the Most Successful Apps Reveal about the Mobile Economy," ACT (July 19, 2013), *available at* <http://www.act4apps.org/wp-content/uploads/2013/07/The-App-Store-After-Five-Years-FINAL.pdf>

⁴ "The European App Economy" ACT (September 2013) *available at* <http://www.act4apps.org/appeconomy/europe/>.

⁵ Harry McCracken, "Who's Winning, iOS or Android? All the Numbers, All in One Place" TIME Tech (April 19, 2013) *available at* <http://techland.time.com/2013/04/16/ios-vs-android/>.

⁶ "State of Mobile Security 2012" Lookout (2012) *available at* <https://www.lookout.com/resources/reports/state-of-mobile-security-2012>.

- **Corporate-funded applications:** full function apps offered at no cost because a separate entity (typically corporate) funds the enterprise to complement existing products.
- **In-app purchasing:** apps that provide users the opportunity to purchase additional features, access, or virtual-goods (enhancements for games, premium services, access to modular content, etc.). Typically, these involve no up-front installation cost.

TheMobileYogi combines all of these except in-app purchasing within our applications, but for the industry at-large that is one of the fastest growing models of consumer mobile apps today.

In order to streamline TheMobileYogi's offerings, we have created first class yoga instruction, innovated in how that content is displayed (by user-complaint for example), and even how we build (customize) our app to reduce the effort (and therefore our cost) to create custom versions of this general app. We have innovated (have intellectual property) at all three content levels.

Small businesses with no software background can now deliver their content to consumers in digital format right to their mobile device. Technology and the evolution of delivery methods have made it possible for businesses of all sizes and models to take advantage of the mobile market.

Application Analytics: telemetry to improve application quality and user experience

At TheMobileYogi, we also track how users use the app "in the wild" and use that information to improve the app itself and to provide evidence to clients of the adoption (and value) of their personalized app.

Mobile content delivery offers a variety of opportunities for app developers to gain more insight into how consumers are using apps. Mobile devices have unique capabilities (accelerometer, augmented reality, gyroscope, camera/scanner, gesture recognition, GPS and navigation, etc.) that drive unique development requirements which, in turn, spawn new development patterns and practices. One of the most notable is the expectation that some form of *application analytics* is always included.

PreEmptive Analytics is an *application analytics* solution that delivers insight and visibility into production application activity and user behavior. Spanning enterprise, web, mobile, and modern cloud, PreEmptive Analytics improves development and operational efficiency and increases the business impact and value of the applications they produce and manage.

PreEmptive Analytics measures and monitors application adoption, feature usage, user behavior and preferences, software quality, and production incidents

Principal PreEmptive Analytics use cases and scenarios include:

Quality	Modernization	Mobile	Compliance & Security
<p>Problem domain: Exceptions and poor UX threaten investment and IT return on development.</p> <p>PreEmptive Analytics advantage Rules align operational response and development priorities with business priorities. Examples include sensitivity to:</p> <ul style="list-style-type: none"> • An incident's impact on operational outcomes • The roles of those most directly impacted <p>Spans application layers capturing interaction across user, presentation, logic, and external software service(s) layers.</p> <p>Results <i>Improve user satisfaction Shorten time to repair & mitigate production issues.</i></p>	<p>Problem domain: Unacceptable dev risk and expense stemming from technical debt or modern (cloud) platform migration plans.</p> <p>PreEmptive Analytics advantage Injection of instrumentation into legacy applications identifies usage patterns and quality issues. This leads to more effective development priorities and scoping efforts.</p> <p>Reformulated applications are instrumented to assess improvements relating to adoption, user experience, and operational impact.</p> <p>Results <i>Reduce effort, speed delivery, reduce risk & expense of critical IT modernization initiatives.</i></p>	<p>Problem domain: Enterprise incorporating mobile applications into corporate portfolio.</p> <p>PreEmptive Analytics advantage Instrumentation support for:</p> <ul style="list-style-type: none"> • Client-side including iOS, Android, Windows Phone, and JavaScript • SW service side including .NET, Java, C++ <p>Telemetry includes hardware, OS, session, feature, exception, and app data.</p> <p>Opt-in, offline caching, and data encryption enforcement included.</p> <p>Results <i>All Quality and Modernization results plus mobile governance, risk & compliance management.</i></p>	<p>Problem domain: Analytics are required, but regulatory, privacy or physical constraints prevent traditional runtime data capture.</p> <p>PreEmptive Analytics advantage Analytics services can be deployed:</p> <ul style="list-style-type: none"> • On-premises, • Across client and development premises, and • Across hybrid cloud/on-premises infrastructures. <p>Business-specific privacy, opt-in, and data retention policies can be enforced.</p> <p>All content and applications are client/development-managed.</p> <p>Results <i>Highly regulated and secure apps also benefit from feedback-driven development practices.</i></p>

All companies are software companies and all apps will be mobile

Applications have emerged as the true workhorse of the 21st century economy— and, as such, represent both tremendous value and significant risk. Even as applications improve productivity and efficiency, they can be exploited, stolen, or used to disrupt the very organizations they serve.

Enterprises across industries, software vendors, and equipment manufacturers have all come to recognize a simple truth; operational and organizational success depends upon application success.

The success of the app industry is driven by the significant growth in use of mobile devices. Sales of these devices continue to outpace all predictions and are providing a huge boost to our economy. Total smartphone sales in 2011 reached 472 million units and accounted for 31 percent of all mobile device sales, up 58 percent from 2010. In the United States and Europe, smartphones sales have overtaken feature phones and the gap is widening.

Mobile connectivity has jumped beyond “consumer phones” to include all manner of commercial software and embedded devices. The marketplace model is being rapidly embraced by enterprises and enterprise software vendors as well. In other words, these business models are not only transforming consumer experiences, they are transforming the way all digital content is being created, distributed, and shared.

Securing Digital Content and Managing Associated Risks

As the value and importance of digital content increases, so does the urgency to secure that content and manage the risks that stem from its theft, subversion, and modification.

One of the special challenges protecting applications is the application must be readable by the operating system or else it cannot be run. As soon as an application can be run, it is

often a relatively trivial exercise to “reverse engineer” or recreate the original source code and/or copy embedded traditional content. The risks that stem from this kind of access include:

- **Intellectual Property theft:** illegal use of traditional content, code snippets, or even an entire application.
- **Content theft:** branding, traditional content, documentation, etc. are stolen.
- **Counterfeiting:** distributing a look-alike application either for sale, to steal user information, or to embed malware – malicious software logic.
- **Service theft:** use knowledge of an application’s logic to access other computer services and content that should only be accessed by that application – when this occurs, the costs for unauthorized access are borne by the original app owner.
- **Data loss and privacy violations:** understanding how data is managed and transmitted can lead to ways to gain unauthorized access.
- **Piracy:** understanding how authorization is granted can lead to understanding of how to “stub out” or circumvent these checks.
- **Malware:** additional logic can be injected into applications making what were safe applications a vehicle to deliver cyber-attacks.

As distribution of software has improved, piracy has become much more efficient. There are now pirate websites and stores and even uncurated app stores which bring the entire world of software in pirate form.

Last year, I was the victim of app piracy. One day, I discovered that I no longer had the top-ranked Yoga app. Curious to see what new release had bested mine, I looked at its features and was shocked to see my own app looking back at me. Aside from a different home page, almost all of the content was mine. The screen shots were all lifted right out of my app as well as my catchphrase “A pose for that.” They even stole the four yoga instructional videos I filmed featuring my wife as the instructor and the background music I composed and performed.

It turns out the thief was from China; I brought my complaint to the app store and the offending app was taken down within 24 hours. I was lucky, but many developers aren’t. Some app stores are far less responsive. I know of a kids app maker whose top-rated pre-K app was “brandjacked.” Essentially, the culprits copied the name, logo, and appearance of a paid app and then offered it for free. Unsuspecting parents downloaded it only to discover that there was no real content inside. But having downloaded the app, they unwittingly installed malicious code that assumed control of the phone and sensitive data while running invisibly in the background. That app maker spent many months pleading with the app market before the offending app was removed.

In circumstances like these, developers lose money from lost app sales and ad revenue while their hard-earned user ratings plummet when the pirated versions don’t perform as well. Developers also bear the added data usage and hosting costs when users of pirated copies access the content and services provided by the legitimate app. As such, even the theft of a free app can mean significant losses to an app maker. This isn’t a victimless crime

and the shame is that is happening for products with a price point that is generally a couple dollars or less. Sometimes it's free. Some apologists claim that content prices are too high and invite piracy, but can that really be the case for an app that's 99 cents - or free?

ACT conducted a study on the fifth anniversary of the Apple App store and found that 73% of apps in the top ten of their categories are made by small businesses. These are often startups and new companies for which profit margins can be very tight. The losses that come from stolen apps can mean the difference between success and failure; hiring staff or firing staff. That's why we feel the work that we do is so important.

PreEmptive Solutions created the obfuscation software category in the late 1990's and today is the leading provider of obfuscation technology hardening software running on mobile devices, traditional PC's, cloud platforms, and inside secure enterprise data centers.

Application analytics, quality, and security

If a developer believes their app is valuable enough to protect, they typically have a special interest in wanting to know how it's behaving (quality and performance) and how it's being used (to increase its value in future versions). In fact, the inability to secure code is a disincentive for developers to invest their time and resources in development – as is the inability to monitor quality of service or to gain insight into user preferences and behaviors.

PreEmptive Analytics goes to great lengths to ensure that the resulting collection, transmission, and management of application telemetry is also secure. Application telemetry is also first class content subject to all of the same privacy, security, and governance requirements as every other content category. PreEmptive Analytics includes the following:

- Development teams own their own data. PreEmptive asks for no rights to aggregate, inspect or resell your data.
- A two-level opt-in switch is included ensuring user opt-in to transmit runtime data from both regular usage AND application exceptions. The logic itself can be injected post-build for .Net and Java and can always be defined by the development organization.
- All data is, by default, encrypted on the wire.
- Device ID's (if they are collected at all) are hashed before they are transmitted.
- Tamper-detection and defense can be used to detect and defend against any attempt to alter or redirect runtime data transmission.
- Obfuscation can be used to obscure inspection by third parties of what is being collected and transmitted.
- Unique keys identify both the organization and the application source for data.

Application security, monitoring, and analytics are essential ingredients in the recipe for creating the optimal environment to encourage application development, innovation, and the economic benefits that inevitably follow,

Next Steps

The growth of digital storefronts like iTunes, Windows 8, Amazon Kindle, Google Play and many, many others show that technology is finding new ways to give consumers the content they want - in a form they like. Whether it's pay up front, pay by the month, ad supported, or some new form we haven't even considered, it all depends on Copyright law to ensure that the person who created the work chooses how to use it.

Therefore I hope that this committee remember three things as it continues its comprehensive review of copyright:

1. Copyright isn't just about movies and music, it's critical to the mobile app ecosystem as well.
2. Technology companies like mine are working hard to help developers and consumers get what they want, how they want it.
3. There's always room for improvement and new ideas. For our part, we plan to continue to innovate new ways to deliver amazing products; we rely on you to create an environment conducive to that innovation.

I would be happy to be involved in this process and provide my experience in the software industry.