

# PATENTS AND SMALL PARTICIPANTS IN THE SMARTPHONE INDUSTRY

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## I. INTRODUCTION

The relationship of patent rights to the competitiveness of companies in the smartphone industry is critical to understanding the dynamics of the smartphone market. This market is growing rapidly worldwide at staggering rates. Just in the third quarter of 2014, vendors sold over 325 million smartphones.<sup>1</sup> Meanwhile, patent grants and patent lawsuits are rising dramatically.<sup>2</sup> Whether or to what extent patents support competitiveness or present barriers to entry is thus a key policy question for intellectual property and the development of future innovations in the smartphone field.

Prior work shows that very little empirical analysis focuses on the specific role that patents play in the competitiveness of participants in information technology based markets.<sup>3</sup> To begin to fill this gap, WIPO commissioned a study that examined the role of patents with respect to large market participants in the smart phone industry (the “2012 Smartphone Patent Study”).<sup>4</sup> The 2012 Smartphone Patent Study found that there was significant fluidity in market entry and exit among the large companies during a period of dramatic growth and concentration of patent portfolios.<sup>5</sup> The study also showed that patent litigation reflected a trend for large companies to use patents as a defensive business strategy.<sup>6</sup>

Since the 2012 Smartphone Patent Study only examined large participants in the market, there remains a need to understand the impact on *small* participants such as small businesses, individual inventors, or organizations with limited involvement in the smartphone field. The goal of this study is thus to analyze comparable empirical data about small market participants with patents and individual inventors in order to ascertain how patents impact their ability to compete in the marketplace.

In Part II of this study, we summarize the definitions for the smart phone market that will be used by our analysis and describe the database of smartphone patents used for this study. To provide comparability, these definitions and the database were the same as those elaborated in

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<sup>1</sup> See *Press Release: Worldwide Smartphone Shipments Increase 25.2% in the Third Quarter with Heightened Competition and Growth Beyond Samsung and Apple*, IDC (Oct. 29, 2014), <http://www.idc.com/getdoc.jsp?containerId=prUS25224914>.

<sup>2</sup> *2014 Patent Litigation Study*, PWC at 5-6 (Jul. 2014), [hereinafter 2014 PWC study] [http://www.pwc.com/en\\_US/us/forensic-services/publications/assets/2014-patent-litigation-study.pdf](http://www.pwc.com/en_US/us/forensic-services/publications/assets/2014-patent-litigation-study.pdf).

<sup>3</sup> See *Committee on Development and Intellectual Property (CDIP): Report on an Analysis of the Economic/Legal Literature on Intellectual Property (IP) Rights: a Barrier to Entry?* WORLD INTELLECTUAL PROPERTY ORGANIZATION (Jan. 16, 2012), [http://www.wipo.int/edocs/mdocs/mdocs/en/cdip\\_8/cdip\\_8\\_inf\\_6\\_corr.pdf](http://www.wipo.int/edocs/mdocs/mdocs/en/cdip_8/cdip_8_inf_6_corr.pdf).

<sup>4</sup> See Joel R. Reidenberg, Jamela Debelak, Daniel Gross & Elaine Mindrup, *The Impact of the Acquisition and Use of Patents on the Smartphone Industry (WIPO: 2013)*, FORDHAM CENTER ON LAW AND INFORMATION POLICY (Dec. 13, 2012), [hereinafter 2012 Smartphone Patent Study] [http://www.wipo.int/ip-competition/en/studies/clip\\_study.pdf](http://www.wipo.int/ip-competition/en/studies/clip_study.pdf).

<sup>5</sup> *Id.*

<sup>6</sup> *Id.*

the 2012 Smartphone Patent Study.<sup>7</sup> In Part III, we develop a methodology to identify small participants in the market and to collect data for these participants. Because comprehensive and reliable data on all small market participants is not readily available, the study analyzed empirical data for market participants holding at least one patent as this group of market participants can be identified comprehensively. However, this selection necessarily limits the results to those entities that have opted into the patent system and omits small entities that have not sought patent protections for their innovations.<sup>8</sup> Next in Part IV, we present the findings from the empirical data in terms of the impact of patents on the small participants. Part V then addresses the impact of patent rights on the openness of the smartphone market with respect to small participants.

## II. DEFINING THE MARKET AND PATENT DATABASE

The 2012 Smartphone Patent Study defined smartphones as “hand-held computing devices that (a) have the ability to make phone calls over cellular networks and (b) can transfer data and run applications over mobile computing networks.”<sup>9</sup> That study further defined the smartphone market as comprised of four segments:

1. Handset providers: Companies that provide smartphone devices to consumers.
2. Software developers: Companies that develop operating systems, communication protocols, and other applications governing the behaviors of smartphones. Software developers provide software packages to handset providers in the form of operating systems and applications as well as to consumers in the form of applications. Operating system vendors represent a subset of the software developer market segment.
3. Hardware suppliers: Companies that provide hardware integrated into the handsets, including computer chips, batteries, antennas, and many other significant components. Hardware suppliers primarily sell integrated hardware, such as chipsets, to handset providers, but also provide parts and accessories, such as extended life batteries and cases, directly to consumers.

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<sup>7</sup> *Id.* at 2-6.

<sup>8</sup> This is an unavoidable selection bias. One study argues that start-ups in the software field may be reluctant to seek patents because of cost and a belief that patent rights will not be sufficiently useful to protect their inventions. See Stuart J.H. Graham, Robert P. Merges, Pam Samuelson & Ted Sichelman, High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Study, 24 Berkeley Tech. L. J. 1255, 1309 (2009). If this is correct more specifically for the smartphone field, then our study findings will not address those innovators.

<sup>9</sup> 2012 Smartphone Patent Study, *supra* note 3, at 2.

4. Designers: Companies that focus on aesthetic design as a selling point for their products. Designers represent a subset of the handset providers and software developers, and generate hardware designs and designs for visual displays for smartphone handsets.<sup>10</sup>

We use the same definition and market segments for this study.

Similarly, the 2012 Smartphone Patent Study identified the most relevant patent classifications for smartphone technologies. The research showed that class 455 in the US PTO classification was the most relevant and that a total of 14 classifications related most closely to smartphones:

**Table 1**

Relevant Patent Classes<sup>11</sup>

<b>Class</b>	<b>Description</b>
<b>320</b>	Electricity: Battery or Capacitor Charging or Discharging
<b>341</b>	Coded Data Generation or Conversion
<b>349</b>	Liquid Crystal Cells, Elements and Systems
<b>361</b>	Electricity: Electrical Systems and Devices
<b>370</b>	Multiplex Communications
<b>375</b>	Pulse or Digital Communications
<b>379</b>	Telephonic Communications
<b>398</b>	Optical Communications
<b>455</b>	Telecommunications
<b>704</b>	Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression
<b>706</b>	Data Processing: Artificial Intelligence
<b>707</b>	Data Processing: Database and File Management or Data Structures
<b>715</b>	Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing
<b>719</b>	Interprogram Communication or Interprocess Communication (IPC) (Electrical Computers and Digital Processing Systems)

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<sup>10</sup> *Id.* at 3.

<sup>11</sup> *Id.* at 8.

From these classes, the 2012 Smartphone Patent Study assembled a patent bibliographic database for the utility patents and a separate database for the design patents, each consisting of the following information for all patents granted between 2006 and 2012:

- **Abstract** – summarizing of the contents of the patent.
- **Patent Type** – determining whether the patent is a utility or design patent.
- **Patent Number** – identifying the relevant patent.
- **US Classification** – identifying the primary classification used for the relevant patent.
- **Title** – identifying the contents of the patent.
- **Number of Claims** – identifying how many claims were included in the issued patent.
- **Assignee** – identifying the current patent holder for the issued patent.<sup>12</sup>

This study takes the 2012 smartphone patent bibliographic databases as the starting point.

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<sup>12</sup> *Id.* at 11.

### III. SMALL PARTICIPANTS IN THE SMARTPHONE MARKET AND DATA COLLECTION

To focus on small smartphone market participants, this study used several metrics to select a random sample of appropriately sized entities and individual inventors. The study looks only at entities and inventors that have already sought patents because meaningful data is available for these market participants. As a result, the study does not consider entities that have no patents such as those organizations that license technologies rather than innovate or those organizations that choose not to seek patents for their innovations.<sup>13</sup> We first identified small participants based on the size they claimed in filings with the United States Patent and Trademark Office (USPTO), then made a selection based on the number of patents they had in the field and the number of patents they had in a particular sub-field. From those entities and inventors, we chose a random sample and conducted a final manual filter to assure that the patent holders were small participants in the smartphone market. To collect further data for analysis, we researched publicly available information about each patent holder and prepared a survey to elicit information about the importance of their patents. In 2012, 20% of the patents granted were related to mobile phones.<sup>14</sup> Less than a decade ago, this number was less than 10%.<sup>15</sup> Overall, smartphone patents account for just over 16% of all active patents.<sup>16</sup> In comparison, the pharma industry, has accounted for a little over 6% of US patents over the past 15 years, and the Information and Communication Technologies (ICT) sector accounts for 40% of U.S. patents.<sup>17</sup>

#### A. Identification of the Entity Size Disclosed to the USPTO

Because the US patent statute provides for reduced filing fees and maintenance fees for small companies and individual inventors, the USPTO has records on the size of patent applicants and holders. Companies and individual inventors qualify for the reduced fees if they meet the following criteria:

**Small Business Entity:**

- 1) Applicant has fewer than 500 employees; and

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<sup>13</sup> Relevant data for non-patent-holding individuals and organizations in the smartphone field is not publicly available. Some studies, though, argue that innovators in certain industries including software choose to use strategies other than intellectual property rights to commercialize their discoveries. See Michael J. Burstein, *Exchanging Information without Intellectual Property*, 91 *Texas L. Rev.* 227 (2012)

<sup>14</sup> Chetan Sharma, *Mobile Patents Landscape An In-Depth Quantitative Analysis*, CHETAN SHARMA (2<sup>nd</sup> ed. 2009) at 7-8,

[http://www.chetansharma.com/Mobile\\_Patents\\_Landscape\\_2013\\_Chetan\\_Sharma\\_Consulting.pdf](http://www.chetansharma.com/Mobile_Patents_Landscape_2013_Chetan_Sharma_Consulting.pdf).

<sup>15</sup> *Id.*

<sup>16</sup> Daniel O'Connor, *One In Six Active U.S. Patents Pertain To The Smartphone*, PROJECT DISCO (Oct. 17, 2012), <http://www.project-disco.org/intellectual-property/one-in-six-active-u-s-patents-pertain-to-the-smartphone/>.

<sup>17</sup> *Id.*



- 2) No rights in the application are promised or licensed to an entity that does not qualify.<sup>18</sup>

**Micro Entity:**

- 1) Must qualify as a Small Business Entity (per the above);
- 2) Applicant or any joint inventor has filed fewer than four US non-provisional patent applications (not assigned to a prior employer);
- 3) Applicant and listed inventor have income for the past year less than \$150,000;<sup>19</sup> and
- 4) No rights in the application have been promised or licensed to a non-micro-entity.<sup>20</sup>

Fordham CLIP obtained the entity size based on these fee categories for all entries in the smartphone patent bibliographic database where an assignee was identified. For utility patents, Fordham CLIP also extracted size information from the USPTO database of maintenance events.<sup>21</sup> For design patents, size data is only available for applications because design patents are not subject to the payment of maintenance fees.<sup>22</sup> In both the design and utility databases, entity size was often not available for patents where no assignee was named (these patents were likely to be held by individual inventors or scholars). Fordham CLIP added all entity size data to the smartphone patent bibliographic database for analysis.

Table 2 below shows the breakdown by entity size for both the utility and design smartphone patent bibliographic databases.<sup>23</sup>

**Table 2**

<b>Entity Size</b>	<b>Number of Entities</b>
Large	223,252
Small	48,945
Micro	89
Unavailable	42,204
<b>Total</b>	<b>314,490</b>

**B. Selecting Small Participants and Generating a Random Sample**

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<sup>18</sup> 13 CFR 121.802(a)

<sup>19</sup> This number will change annually based upon census median US household income (3X median income).

<sup>20</sup> 35 U.S.C. 123.

<sup>21</sup> Every time a payment was made on a utility patent, the entity size of the payor at the time of payment was recorded by the USPTO.

<sup>22</sup> Fordham CLIP thus captured entity size as of the time the application was filed.

<sup>23</sup> Another study estimated that approximately 250,000 patents were relevant to modern smartphones in 2011. RPX Corp., Amendment No. 3 to Form S-1, 59 (Apr. 11, 2011), *available at* <http://www.sec.gov/Archives/edgar/data/1509432/000119312511240287/ds1.htm> (last visited Nov. 20, 2014).

From the large number of potential market participants, relevant small participants had to be selected and a random sample needed to be drawn for analysis. In selecting the population to analyze, we sought a diverse group of small businesses and startups. First, the utility patent database was divided by classification into three groups - communications, hardware, and software - using the classifications shown in Tables 3, 4, and 5 and drawn from the 2012 Smartphone Patent Study<sup>24</sup>:

**Table 3**

**Hardware Classification Numbers**

<b>Class</b>	<b>Description</b>
<b>349</b>	Liquid Crystal Cells, Elements and Systems
<b>361</b>	Electricity: Electrical Systems and Devices
<b>320</b>	Electricity: Battery or Capacitor Charging or Discharging

**Table 4**

**Software Classification Numbers**

<b>Class</b>	<b>Description</b>
<b>341</b>	Coded Data Generation or Conversion
<b>704</b>	Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression
<b>706</b>	Data Processing: Artificial Intelligence
<b>707</b>	Data Processing: Database and File Management or Data Structures
<b>715</b>	Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing

**Table 5**

**Communications Classification Numbers**

<b>Class</b>	<b>Description</b>
<b>370</b>	Multiplex Communications
<b>375</b>	Pulse or Digital Communications
<b>379</b>	Telephonic Communications
<b>398</b>	Optical Communications
<b>455</b>	Telecommunications
<b>719</b>	Interprogram Communication or Interprocess Communication (IPC) (Electrical Computers and Digital Processing Systems)

<sup>24</sup> 2012 Smartphone Patent Study, *supra* note 3 at 12-13.

Design patents were placed into their own category.

Table 6 below shows the breakdown by entity size and smartphone-related category of the entire smartphone bibliographic patent database.

**Table 6**

**Smartphone Patent Bibliographic Database  
Category Entity Size**

<b>Category/Size</b>	<b>Number of Entities</b>
<b>Communications</b>	<b>95,057</b>
Large	86,835
Small	7,301
Micro	30
Unavailable	891
<b>Hardware</b>	<b>25,727</b>
Large	23,225
Small	2,203
Micro	13
Unavailable	286
<b>Software</b>	<b>43,186</b>
Large	38,177
Small	4,373
Micro	46
Unavailable	590
<b>Design</b>	<b>150,520</b>
Large	35,068
Small	75,015
Unknown	40,437
<b>Grand Total</b>	<b>314,490</b>

Because the number of qualifying entities in the database was so large, a random sample was necessary. However, the generation of a random sample from the database at large (or “direct element sampling”) would have yielded unpredictable results and would not necessarily provide a clear picture of the various kinds of small players in the data set. For instance, a random sample may have been skewed toward one category of patents such as design or communications, which make up larger relative proportions of the database. Similarly micro entities made up less than 1 percent of the database entries because the designation is new and

might have been missed altogether. To avoid these potential biases, we adopted the “population framing” method for the generation of the random sample.<sup>25</sup>

For population framing, the patent database was further subdivided as shown below in Table 7. From each of the patent classification groupings, companies with 3 to 5 patents were extracted. This would ensure that niche players in each category would be analyzed. We did not limit these patent-holders by entity size in order to capture startups and small companies that were purchased by larger entities before making their first maintenance payment. Similarly, we extracted as a sample frame for each of the patent classification groupings, companies that reported a small or micro entity size, regardless of the number of patents they held. This was to ensure there was no bias in the sampling based on the number of patents. To obtain companies that were not limited to niche products or services, we also extracted all entities with 1-2 patents regardless of reported size as a population frame and all companies that reported small or micro status with 10 or more patents. To capture individual inventors or unincorporated entrepreneurs, we also framed all filings for which entity status was not available and that had no assignee name.

**Table 7**

**Population Sample Frames**

<b>Category</b>	<b>Entity Size</b>	<b>Number of Patents</b>	<b>DB Hits</b>
Communications	Any	Between 3 and 5, inclusive	3,692
Communications	Small or Micro	Any	7,331
Hardware	Any	Between 3 and 5, inclusive	1,283
Hardware	Small or Micro	Any	2,216
Software	Any	Between 3 and 5, inclusive	2,128
Software	Small or Micro	Any	4,419
Design	Any	Between 3 and 5, inclusive	12,067
Design	Small or Micro	Any	35,069
Any	Small or Micro	10 or more	14,713
Any	Any	1 or 2	34,492
Any	Small, Micro, or N/A	N/A – (No Assignee Name)	2,250
<b>Grand Total</b>			<b>119,660</b>

Because the frame selection resulted in more companies than could reasonably be studied, a random sample was chosen. Each entry was assigned a random number within each population frame and the groups were shuffled by sorting on the random number. We chose an initial random sample of 400 companies by extracting the patent entries from the categories

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<sup>25</sup> In statistics, “population framing” allows the survey planner to organize a data set to improve the efficiency and effectiveness of the random sample and to ensure that the various groups of interest are represented in the random sample. See RAYMOND JAMES JESSEN, STATISTICAL SURVEY TECHNIQUES 160-62 (1978).

shown in Table 7. This large initial sample was chosen to account for duplication and so that sampling errors could be corrected through manual filtering, as discussed below.

Finally, to be sure that we did not omit any important players with patented technologies in the relevant field, we applied key word searches to the full smartphone patent bibliographic database for a manual review. The key word search was conducted on the abstract and title of every patent in the database for the following terms: “smartphone,” “smart phone,” “handset,” “mobile phone,” “cellular phone,” “touchscreen,” “3G,” and “4G.” Small or micro entities that hit on the keywords were added to the random sample for filtering. Most results yielded large companies such as Samsung and High Tech Computer Corp. Only 19 potentially small companies were identified using this method and were included in the initial frame.

### **C. Manual Filtering**

Manual filtering entailed a review of the patent or patents for each of the randomly selected entities and an initial review of the publicly available data for each company or inventor to confirm the entity size as a small company and whether the business was relevant to the smartphone industry.<sup>26</sup> Some very large organizations with few patents in the relevant field were removed by this filtering.<sup>27</sup> Similarly, a manual review and filter of the 19 potentially small companies identified by key word searches was also conducted. This review sought to confirm the claimed entity size, the relevance of the patents to smartphones, and the actual involvement of the business in the smartphone market.

Also, some patents were assigned to multiple large entities at the same time. These were either charitable conglomerates or telecommunications standards co-invented in the context of a standards setting organization.<sup>28</sup> Though these entities were small patent holders and novel, we did not consider them to be small players. Therefore, they were not included in the final sample.

In addition, several very large entities, captured in the random sample as patent holders, had small entity status due to their non-profit structure. This included government-sponsored research institutes, institutions of higher education, and standards setting organizations listed as patent owners. These organizations were also pruned from the sample. Standards-essential

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<sup>26</sup> The main sources used (where available) for this preliminary review were the entities’ own websites, LinkedIn and similar marketing materials, Business Week entries, other patents assigned to the entity or inventor, and news articles.

<sup>27</sup> This included companies like Sirius and NEC. Many of these large companies made a one-time foray into the smartphone world (i.e. internal startups), and thus were not included in this study of small companies. Several large corporations had subsidiaries or slightly misspelled names, which caused them to erroneously show up in the small entity population frame.

<sup>28</sup> Charitable conglomerates, such as Intel-GE Care Innovations, provide useful innovations to the public, often in the form of patents. Standards setting organizations, in this database, mostly fell in the realm of telecommunications standards. These are often created and proposed to a standards setting organization by multiple companies who then file a joint patent.

patents not owned directly by these large non-profit organizations would still be captured in the sample.

Care was taken not to exclude large entities that were, until recently, small players. To accomplish this, a historical records and news search was conducted to determine whether the entity recently was in a startup funding phase, was purchased by a larger corporation, suddenly expanded, or went public. Likewise, small companies that recently went defunct and/or sold their intellectual property to larger entities were maintained in the sample.

The sample was also pruned of patents and businesses that were clearly not related to the design, software, hardware, or communications involved with smartphones. The sample was also expressly filtered to exclude accessories to smartphones such as batteries and cases, base-station technologies, server-side technologies, and product packaging.

Lastly, the sample was filtered to exclude industrial wireless communications innovations that were not related to smartphones, such as error monitoring on pump jacks and vehicle fleets, or municipal communications grids. Likewise, entities with patents for mesh networks were excluded unless they dealt specifically with smartphones. Semiconductor companies that did not market to smartphones were excluded as well.

In the process of pruning, several more random samples were extracted from the population frame to achieve a data set comparable to the size of the 2012 Smartphone Patent Study. Of 650 companies initially extracted as a random sample for consideration, 46 companies and individual inventors satisfied the filtering criteria and were retained for analysis as small participants in the smartphone market. These small participants are listed in Appendix A.

#### **D. Collection of Publicly Available Data**

For each of the 46 selected small market participants, a data set was compiled using publicly available sources. The data consists of (1) the type of business conducted by the companies; (2) contact information; (3) litigation involving the company, both patent and non-patent; (4) acquisitions, funding, and other investment information; (5) patents; (6) press releases and web marketing related to patents. The following describes generally the information collected and the public sources of data that were reviewed and cross-checked for each category.

1. **Type of businesses conducted:** This data gives a brief overview of the company's main business and how, if at all, it is related to smartphones. The information was used to evaluate each company's perceived impact on the target industry – smartphones. The information was collected through the following online resources: LinkedIn; CrunchBase; Bloomberg BusinessWeek; and companies.findthebest.com.
2. **Contact information:** The names of individuals at the target companies including title of the person, address, phone number, email, and website of the company, were collected where available. This information was used to contact the companies to administer the survey. This information was collected through the following online resources: USPTO Public PAIR; LexisNexis; Yahoo Business; Bloomberg

BusinessWeek; and [companies.findthebest.com](http://companies.findthebest.com). Where this information was unavailable, we attempted to contact the attorney that filed the patent application in order to try to make contact with the patent holder.

3. **Litigation information:** All U.S. court litigation where the small participant companies were a party, including patent infringement and non-patent cases, were collected and reviewed. This information was used to determine how these companies interact and conflict with each other using the U.S. court system. RPX Corp., LexisNexis, and Bloomberg News databases were used to identify the relevant litigations. In total, we identified and reviewed 38 patent lawsuits and 22 non-patent ones.
4. **Acquisition, funding, and other investment information:** Information regarding the date, amount, and participants in mergers and acquisitions, rounds of funding, public stock investments, and other investments were collected for each target company. This information was compared to the patent data to determine whether any correlation existed between patents and investments. The information was collected from [AngelList](http://AngelList.com), [CBInsights.com](http://CBInsights.com), [Crunchbase.com](http://Crunchbase.com), [Dealipedia.com](http://Dealipedia.com), [BusinessWeek.com](http://BusinessWeek.com), [edgar-online.com](http://edgar-online.com), [BizJournals.com](http://BizJournals.com), and [Nasdaq.com](http://Nasdaq.com).
5. **Patents:** A database of each target company’s patent portfolio was collected and then compared to our database of smartphone-related patents from which we chose our initial sample of target companies. This information was mined from the bulk patent data provided by the USPTO through Google’s and ReedTech’s database retrieval tools found at [google.com/patents](http://google.com/patents) and [patents.reedtech.com](http://patents.reedtech.com), respectively, as well as by [strutpatent.com](http://strutpatent.com).
6. **Press releases and web marketing:** Publications by and about each target company were retrieved and reviewed for discussion of the company’s patent portfolio. This information was used to gauge the perceived importance of each company’s patents as seen by the companies themselves and in the public press. This information was collected from Google News, Bloomberg News, CrunchBase, and each company’s websites, where one or more existed.

## E. Demographic Breakdown of the Sample

Table 8 shows the countries of origin for the 46 selected small participants.

**Table 8**

Breakdown by Country

Country	Total
Canada	2
Israel	1

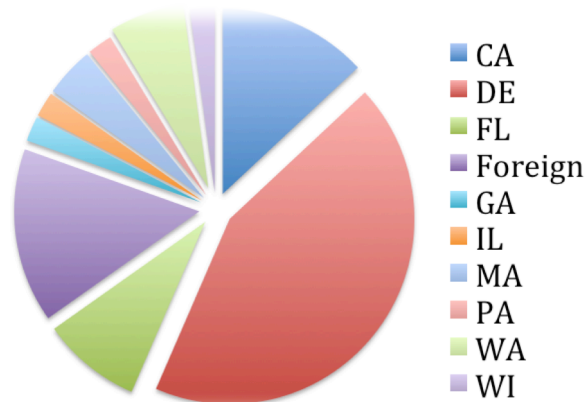
Netherlands	1
Sweden	2
Switzerland	1
US	39
<b>Grand Total</b>	<b>46</b>

The vast majority of the 46 selected small participant companies were domestic U.S. companies or ones that had headquarters and strong ties in the U.S. The seven foreign companies appear to be from known startup hubs. Israel and Sweden are both well known for their startups and Switzerland’s “Silicon Alps” is an up-and-coming startup hub. According to data compiled by Washington State University College of Business, Canada ranks as one of the top places to build a startup due to its high rate of post-secondary education, low cost of living, and relatively flat rate of inflation. Amsterdam too has had its fair share of startup successes.<sup>29</sup> For these reasons, it is not surprising that our random sample pulled companies from these specific countries.

Similarly unsurprising is the distribution of the states of incorporation of smartphone startups within the U.S. Table 9 shows this distribution. The largest percentage (43.5%) is incorporated in Delaware. This compares to the incorporation rates for other industries. In 2012, more than 50% of the major corporations in the world were incorporated in that state.<sup>30</sup>

**Table 9**

Breakdown by State of Incorporation



<sup>29</sup> *Location, Location, Location*, WASHINGTON STATE UNIVERSITY, <http://omba.wsu.edu/resources/infographics/infographic-location-location-location/> (last visited Oct. 18, 2014).

<sup>30</sup> Leslie Wayne, *How Delaware Thrives as a Corporate Tax Haven*, NEW YORK TIMES (Jun. 30, 2012), [http://www.nytimes.com/2012/07/01/business/how-delaware-thrives-as-a-corporate-tax-haven.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2012/07/01/business/how-delaware-thrives-as-a-corporate-tax-haven.html?pagewanted=all&_r=0).

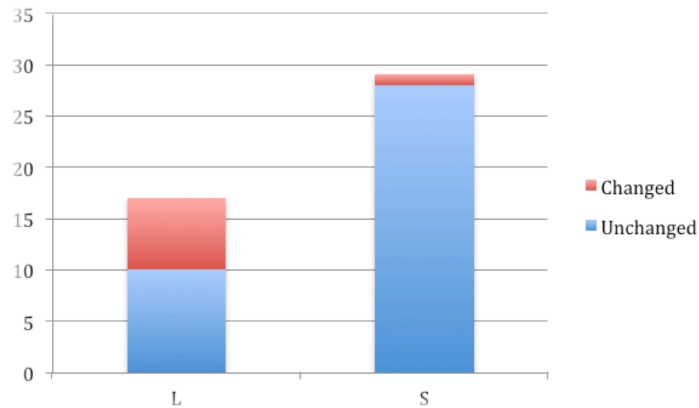


Of the 46 chosen participants, 17 registered with the USPTO as large organizations and 29 as small ones. Of the large organizations, 7 changed from small to large over the date range examined. Of the small ones, only 1 changed from large to small. Therefore, at some point over the time period studied, 78.3% of the chosen participants were registered as small. This is reflected in

Table 10 below.

**Table 10**

**Breakdown by Reported Size**



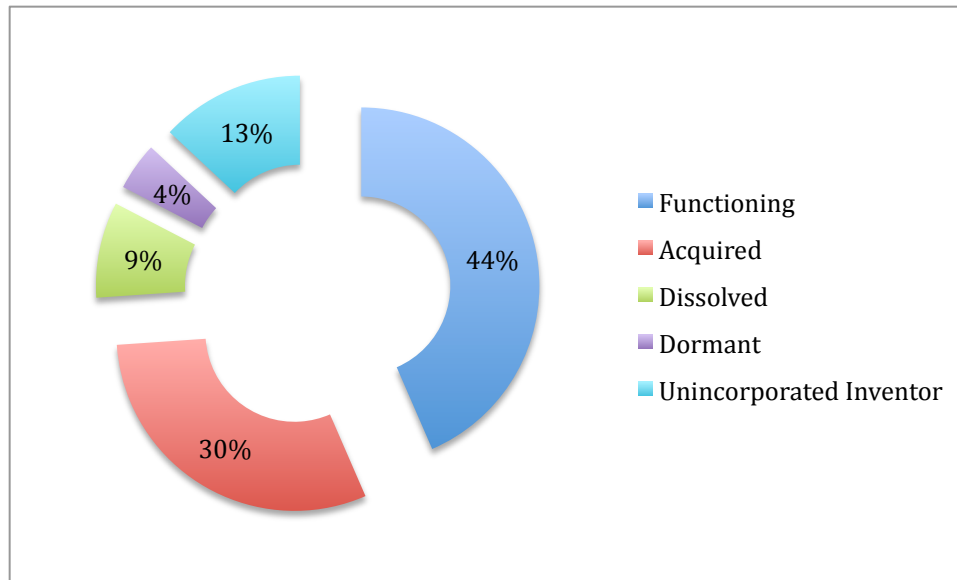
As of October 2014, most of the 46 selected small participants were still alive in some form. Of the selected participants, 60.7% are still functioning or have been acquired by a company that is still functioning; 9% have dissolved; 4% are dormant but not formally dissolved; and 13% are inventors in the smartphone field who have not assigned their patent rights to a corporate organization.<sup>31</sup> Table 11 shows this distribution.

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<sup>31</sup> Companies classified, as “Functioning” were those companies that were current on their corporate filing fees in the place of incorporation or otherwise were still clearly doing business (e.g. active website and/or sales). Companies classified as “Acquired” were determined with reference to public information through AngelList, CBInsights.com, Crunchbase.com, Dealipedia.com, BusinessWeek.com, edgar-online.com, BizJournals.com, and Nasdaq.com. Companies classified as “Dissolved” were those companies that filed for dissolution with the secretary of state in the place of incorporation. Companies classified as “Dormant” were those companies that were delinquent on one or more filing fees in the place of incorporation, allowed their website to go down for an extended period of time, and/or where press releases indicated the company was no longer functioning. Companies classified as “Unincorporated Inventors” were those whose patents were assigned directly to an inventor and not a corporate entity.

**Table 11**

Current State of Sample Companies



For other demographic data, public information was not easy to find for our selected sample because most of the sample consisted of small private corporations (some foreign) or individual inventors with no public reporting requirements. Only 9% of our sample were at some point public companies. We were, nonetheless, able to collect detailed funding information totaling over \$2.8 billion for 63% of the selected companies. Of the 46 selected small participants, 47.8% received venture funding. A few of our participants also received a mix of funding from government contracts, “Angels,” partial acquisitions, full acquisitions, and joint ventures. Litigations are, for the most part, public so that was more easily collected. Thirty five percent of the study participants were involved in some type of litigation including intellectual property and other matters, as plaintiff or defendant. This is much lower than the reported rate of litigation (82%) for US companies and lower than the rate of litigation for smaller companies (65%).<sup>32</sup>

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<sup>32</sup> In assessing litigation trends, Norton Rose Fulbright surveyed US companies and reported that in the US: (1) 82% of companies had at least one suit filed during 2013; (2) 65% of smaller companies (those with less than \$100 million in revenue) had at least one suit filed. *See Norton Rose Fulbright's 10th Annual Litigation Trends: US companies increasingly concerned about regulatory investigations*, NORTON ROSE FULBRIGHT (Apr. 15, 2014), <http://www.nortonrosefulbright.com/knowledge/publications/115045/norton-rose-fulbrights-10th-annual-litigation-trends>.

## **F. Survey**

In addition to the data we collected from public sources, we sought direct information from the 46 selected small participants. We constructed a survey to collect information about the use and effect of smartphone patents from individuals at the chosen companies. This survey is attached as Appendix B.<sup>33</sup>

Survey respondents were offered the opportunity to remain anonymous. But, even with that assurance, we received an insufficient number of responses to perform any meaningful analysis.

## **IV. ANALYSIS OF THE MARKETPLACE**

In this Part, we analyze the empirical data. First we examine the smartphone patent database as a whole. And then we examine how patent portfolios are built as a small player in the smartphone field begins to grow. This examination looks at the relationship between smartphone business activity and patent holdings and at the relationship between overall business activity and patent holdings. Next we examine whether patent portfolios affect the ability for small participants to secure funding. Finally, we investigate whether patent litigation is helping, harming, or neutral to the small players.

### **A. Smartphone Business Activity and Patent Holdings**

#### **1. Analysis**

From a high level taxonomy of the entire smartphone patent database including all organizations holding any smartphone-related patents, it appears that smartphone-related patents are concentrated with large companies. Organizations that registered as large (i.e. with more than 500 employees) hold 90.4% of smartphone utility patents.<sup>34</sup> Broken down by type of patent, the concentration of large corporations remains the same. Large corporations own 91.4%,

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<sup>33</sup> We identified contact information for 41 of the firms that were selected for this study. We began sending emails to these contacts on July 10, 2014. We sent a first reminder email to the participants on July 22, 2014. Then, we began calling each company to solicit responses on August 12, 2014. We continued calling the numbers that had had not been disconnected, and for whom participants had not specifically opted out, until September 5, 2014. We sent a final reminder email on September 3, 2014 to the 35 participants that had not yet responded to the survey and whose email addresses did not bounce back as undeliverable on the first email attempt. All-in-all, and despite these efforts, the Fordham CLIP received a very minimal response to the survey. Two companies agreed to submit electronic survey responses, but only one in-fact did so, and one company provided off-the-record oral responses.

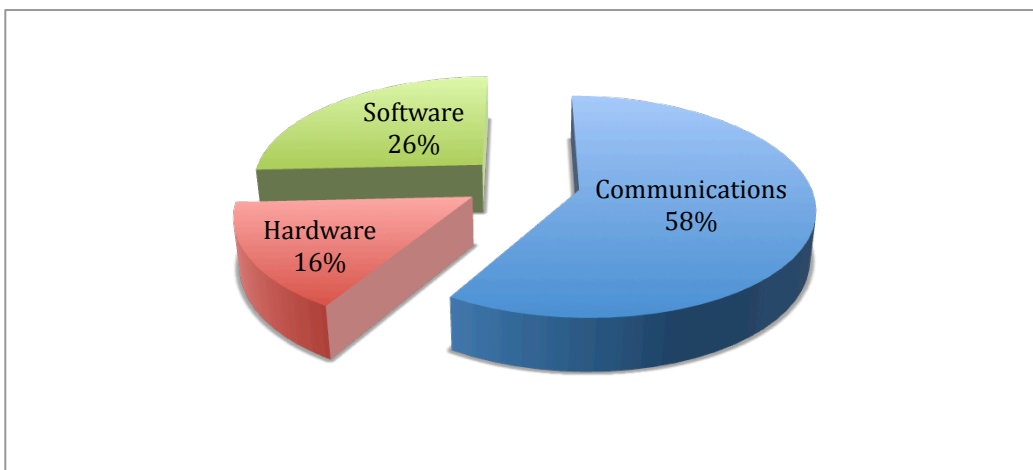
<sup>34</sup> See *supra*, section III.A.

90.3%, and 88.4%, respectively, of the communications, hardware, and software patents.<sup>35</sup> On average, a large corporation in the smartphone field has 1488 patents. By contrast, a small organization has an average of 61 patents and a micro organization (though this designation is fairly new in the USPTO) has an average of 3.4 patents.

Most smartphone-related utility patents are communications patents. There are many more software patents than there are hardware patents, but both categories represent a significant percentage of smartphone patent portfolios. Table 12 shows this distribution.

**Table 12**

Breakdown of Smartphone Utility Patents in Database<sup>36</sup>



Our randomly selected sample of small players has a similar breakdown, albeit with a few key differences as shown in Table 13 below. The basic hierarchy is the same; communications represents the largest share followed by software and then hardware. However, for our small players, there is a higher percentage of communications patents and a very small percentage of hardware patents.

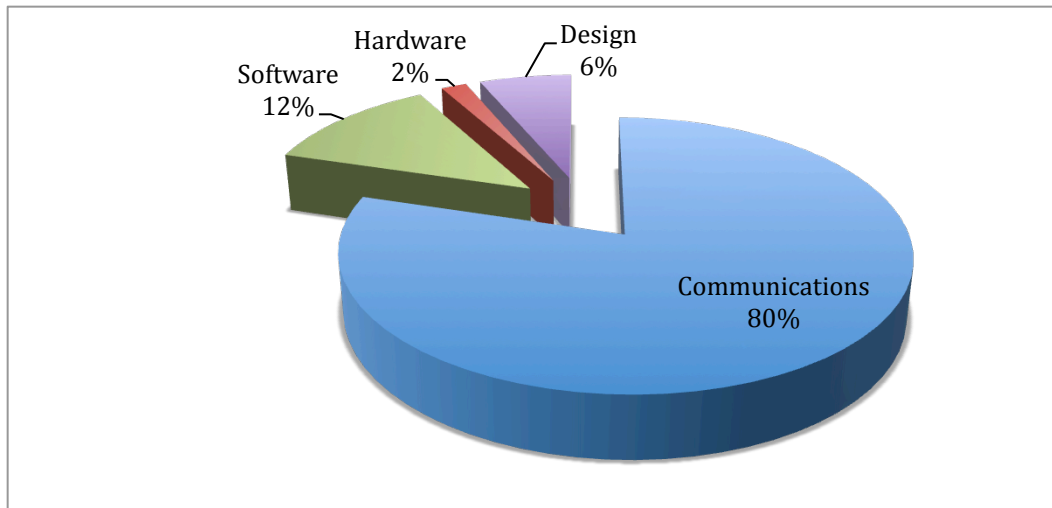
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<sup>35</sup> The patent classification numbers that break down into these three categories, communications, hardware, and software, are defined above in section III. B.

<sup>36</sup> Design patents are not shown here for the overall database because the separate database that was constructed for the 2012 Smartphone Patent Study was over-inclusively to account for the uncertainty of design classifications.

**Table 13**

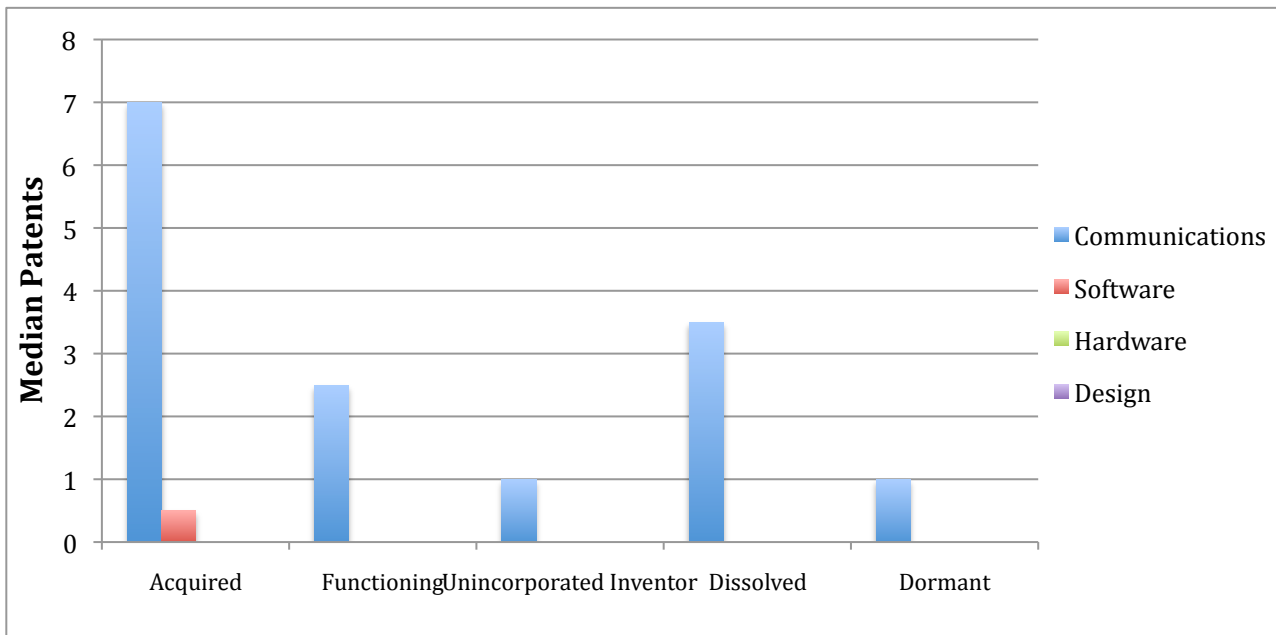
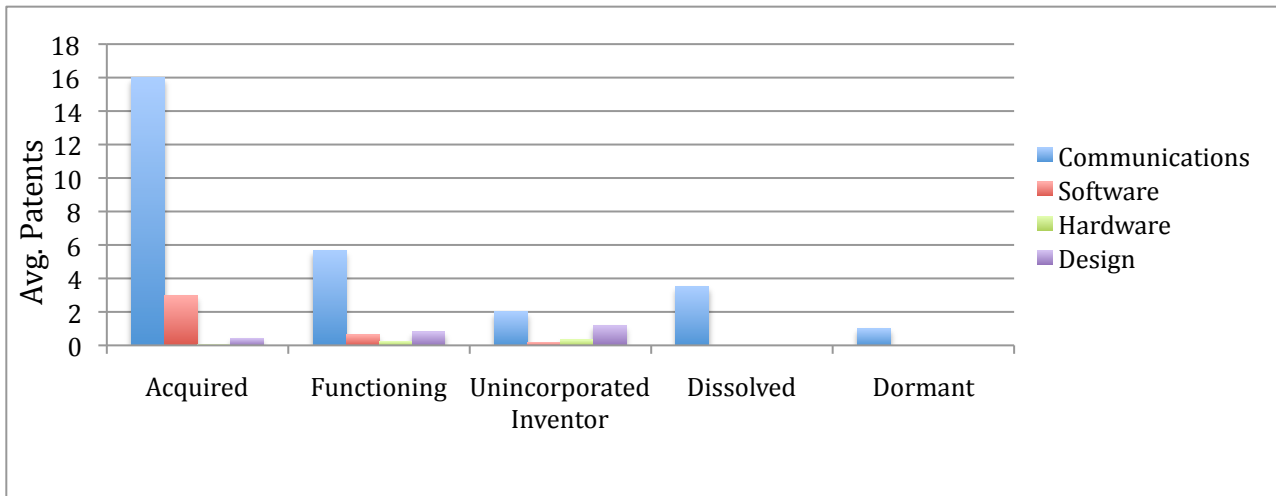
**Breakdown of Smartphone Patents in Sample**



Among the 46 selected small participants, those that have been acquired or are still functioning had, on average, a larger portfolio. Similarly, the median portfolio size for acquired companies was noticeably larger than those for all other dispositions. However, an outlier in the functioning category meant that the median for functioning companies was slightly lower than the median holdings for dissolved companies. This is shown in Table 14. The category of patents a company has does not seem to matter for the company's long term outcome. All the companies that were dissolved or are now dormant only had a small number of communications patents. Of the sample, 60% of the companies had only communications patents in their portfolios, 13% had only software patents, 2.2% had only hardware patents, and 2.2% had only design patents. This means that only 22.6% of selected small participants had a diversified portfolio.

**Table 14**

**Patent Categories and Business Survival**



## 2. Impact

The demographics of the small participants with patents indicate that they have a surprisingly strong survival rate. Studies show that between 40% and 90% of all types of

startups in the United States fail, depending on the industry.<sup>37</sup> While these studies do not distinguish between start-ups with patents and those without, the failure rate of the small participants that have patents in the smartphone industry (as measured by dissolution or dormancy over the six year period between 2006-2012) was only 13%.<sup>38</sup> This suggests that small companies with one or more smartphone patents are significantly more stable than startups in general.<sup>39</sup>

While the overall failure rate of the small participants was extremely low, the failures seemed to be concentrated in participants holding communications patents.<sup>40</sup> Table 14 illustrates that those small participants with more diversified portfolios, or at least a large number, of smartphone patents had a better chance of business survival. For those companies that were dissolved or went dormant, half formally assigned all their patents to another company and the disposition of the patents of the other half could not be ascertained.<sup>41</sup> The unknown disposition of patents for half the failed companies may reflect either an abandonment of the patent or an unrecorded assignment. In any case, the recorded assignments of 8 of the 19 smartphone patents held by

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<sup>37</sup> Faisal Hoque, *Why Most Venture Backed Companies Fail*, FAST COMPANY (Dec. 10, 2012, 6:02 AM), <http://www.fastcompany.com/3003827/why-most-venture-backed-companies-fail>; *Startup Business Failure Rate By Industry*, STATISTIC BRAIN, <http://www.statisticbrain.com/startup-failure-by-industry/> (last visited Oct. 18, 2014); Glen Dalakian II, *90% of Tech Startups Fail*, WAMDA (Feb. 7, 2013), <http://www.wamda.com/2013/02/90-percent-of-tech-startups-fail-infographic>; Scott Shane, *Startup Failure Rates*, SMALL BUSINESS TRENDS (Apr. 28, 2008), <http://smallbiztrends.com/2008/04/startup-failure-rates.html>.

<sup>38</sup> See *supra*, Tables 11 and 14 and accompanying text. Recognizing that there are other possible instances that may be considered failures, including bankruptcy restructuring, unfavorable acquisitions, or a complete lack of market share growth, the study examined the publicly available data and did not find any other significant events indicating apparent “failure” in this sample.

<sup>39</sup> Failure rates specific to start-ups holding patents are not available and thus a direct comparison for patent holding start-ups and patent holding smartphone market participants is not possible.

<sup>40</sup> For our sample of small participants, communications patents are clearly the most important and sought-after patents in the field. Communications patents have, at their heart, a theoretical and cognitive element that does not always require the application of expensive machinery to invent. Reducing hardware to practice – whether it is a consumer device or component for another business to use – is more expensive. This may explain the difference between the relative portfolios of the small and large players. It may also be that participation in the various communications standards-setting organizations is lucrative enough to incentivize even small companies to focus their efforts in that area. While designing around software and hardware patents may be possible, communications patents are often incorporated into standards, such as 4G LTE, and may be more difficult to avoid. This study did not identify whether any patents were declared essential to a standard. A prior study found that less than one third of smartphone patents in litigation were declared essential to a standard concluding that “the smart phone patent wars do not appear to be driven by SEPs. . . .” Kirti Gupta & Mark Snyder, *Smart Phone Litigation and Standard Essential Patents*, HOOVER IP WORKING PAPER SERIES NO. 14006 (May 16, 2014), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2492331](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2492331).

<sup>41</sup> Of the 6 companies that were dissolved or dormant, in the sample half assigned all of their smartphone patents to another company (Wisair, ORO Grande Technology, and ISP Operator) and the disposition of the smartphone patents for the other half (Samhain Union, incNetworks, NexStep) is not known. There is no information in the USPTO assignment database for the 11 patents held by Samhain Union, incNetworks or NexStep.

failed companies indicates the smartphone patents are still an important asset to be salvaged from a company’s failure. That some companies took the time to perfect their assignment by filing it with the USPTO (8 patents in total) provides an indication that these smartphone patents had ongoing value despite the company failures.

While design patents are also part of a well-diversified portfolio, small participants do not typically include design patents in their portfolios. Our sample companies and inventors had, on average, less than one design patent each and only 8.6% of the sample had a design patent. The rarity of design patents may be because the small participants are rarely large enough to manufacture, sell, and distribute a physical consumer product. It is also possible that, to protect the outward appearance of a product, companies simply rely on trademark and trade dress law.

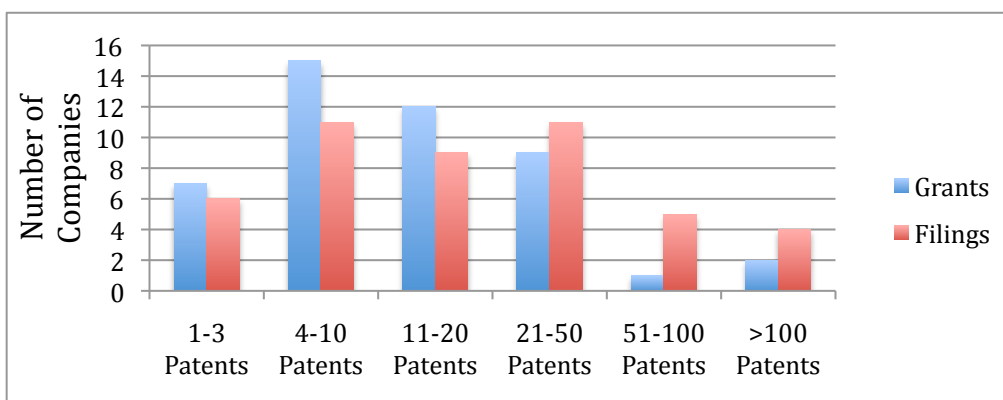
## B. Overall Business Activity and Patent Portfolios

### 1. Analysis

Many of the 46 selected small smartphone market participants also have patents in fields other than smartphones. This means that their business activities are not exclusively, and possibly not predominantly, in the smartphone market. Overall, only 41% of the patent portfolios owned by the entities in the sample are smartphone-related patents. On average, the small participants have 22 patents granted and 32 patents filed. The median number of patents granted, however, is only 11, with the largest number of companies in the 4 to 10 patent range. A few entities in the sample with very large portfolios (specifically, SiRF with 268 and Newport Media with 116 patents) skew the average to appear higher. Table 15 shows this frequency distribution of utility patent grants and filings.

Table 15

Total Utility Patent Grants and Filings



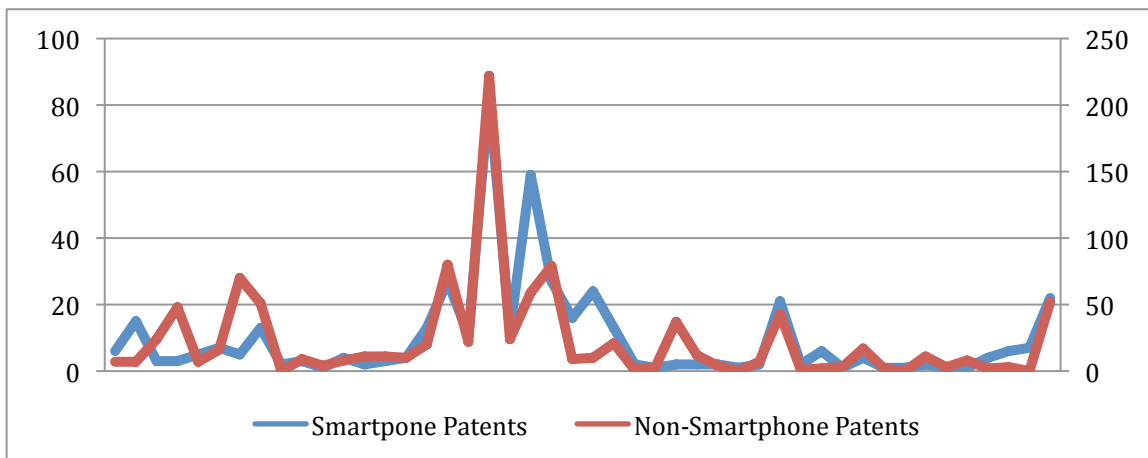
With respect to the overall types of patents held by the small participants in the smartphone market, they appear to keep their portfolios balanced between smartphone patents and other patents, as seen in Table 16 below. The correlation coefficient between the arrays of



the number of smartphone patents per entity and the number of other patents is 0.84 with a coefficient of determination ( $r^2$ ) of 70.5%.<sup>42</sup> This correlation shows that small players in the smartphone market generally keep the number of smartphone patents in their portfolio in similar proportion to the number of non-smartphone patents.

**Table 16**

Patent Distribution



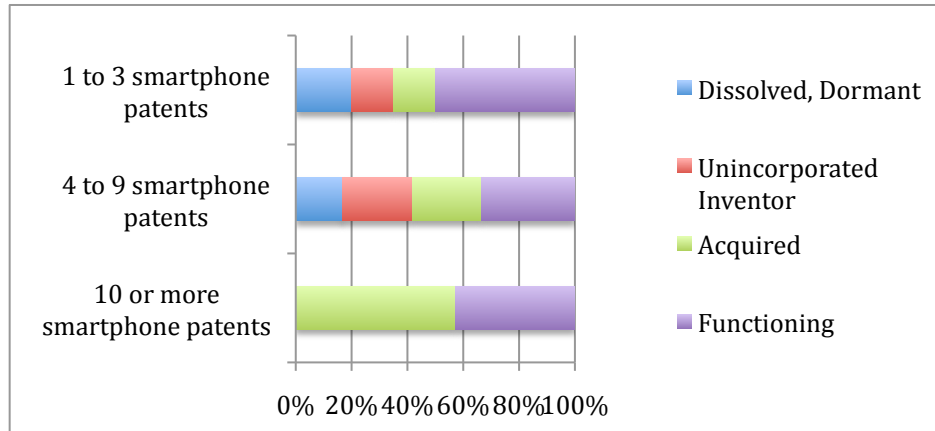
In terms of business continuity, Table 17 below shows the outcomes based on the size of the patent portfolio. Of the sample participants with 10 or more patents, 8 were acquired and 6 are still functioning. None of these small participants appear to be dissolved or dormant. In other words, companies with 10 or more patents tend to survive. With respect to the companies that own 1 to 3 patents, these market participants are distributed pretty evenly among the categories with the largest portion appearing to still be functioning.<sup>43</sup>

<sup>42</sup> The correlation coefficient here is used to measure the direction and strength of the linear relationship between these two variables, smartphone patents and other patents. This coefficient is between -1 and 1. The closer the coefficient is to 1 or -1, the stronger the relationship between the variables. If it is close to zero, there is no correlation. A coefficient of greater than .8 generally means a strong correlation. If the coefficient is positive, it means that the two values tend to change in the same direction. If it is negative, they tend to change in opposite directions. The square of the coefficient (referred to as the “coefficient of determination”) is the measure of how often of the variance of one variable is predictable by a change in the other.

<sup>43</sup> The instance of lapsed utility patent maintenance fees is very low in our sample indicating the continued operation of the patent holder. Seventy four percent of the sample did not miss a fee; all of their patents are in good standing. Five out of the 12 companies (42%) that allowed one or more patent

**Table 17**

**Outcome Based on Number of Patents**



## 2. Impact

The overall patent holdings indicate that a larger patent portfolio correlates to a higher likelihood of business survival. None of the companies with 10 or more smartphone patents in their portfolio appear to have stopped functioning during the study period. By contrast, nearly 20% of the companies with fewer than 3 patents appear to have failed; the remaining companies with fewer than 3 patents appear to be still functioning or have been acquired. Table 17 reveals similarly that the companies with 4 to 6 patents fail more frequently than those with larger portfolios. This may show that there is a benefit to having patents for the survival of a business. After 10 patents, a company's survival rate increases dramatically.<sup>44</sup> But, this may simply indicate that companies with more funding obtain more patents.<sup>45</sup> We examine relationship between funding and patents in Part IV.C below.

The research also indicates that companies rarely focus exclusively on smartphones. Though we have identified companies and individuals that have a small presence in the

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fees to lapse were acquired by another company; 3 are still functioning; and only 3 appear to be dormant or dissolved. All but one have other patents in their portfolio for which fees are in good standing. Design patents have no maintenance fees, so no data about their retention is available.

<sup>44</sup> This study found no correlation between the age of a company and the number of patents it held. A regression analysis yielded an R square of 0.002 for the correlation between the age of a company and the number of smartphone patents that it owned and a R square of 0.02 for the correlation between the age of a company and the total number of patents (including non-smartphone patents) that it owned.

<sup>45</sup> A recent study conducted by data analytics firm CB Insights strongly suggests that the amount of funding a company raises is strongly correlated with the likelihood of its survival. 55% of startup companies that failed had raised less than \$1 million. *The R.I.P. Report – Startup Death Trends*, CBINSIGHTS (Jan. 18, 2014), <https://www.cbinsights.com/blog/startup-death-data/>.

smartphone market place, only 41% of the patents in their portfolios were smartphone patents. The available websites for the 46 selected small participants reveals that most of the small participants have other products and markets outside the smartphone field. For example, 82.6% of the sample had patents in non-smartphone patent classifications; of the remainder, 6.5% were individual inventors. Only a small portion of the sample (10.9%) were companies that patented technologies solely related to smartphones.<sup>46</sup>

With respect to design patents, the trends are similar to the industry as a whole. The small participants do not obtain design patents nearly as often as utility patents and generally they rarely obtain design patents. As a general matter, design patents are valuable to protect the external designs of consumer-facing products and the small participants typically do not offer consumer products. The small participants generally sell their products to other businesses or their consumer product is software, not a physical product. This may be one reason design patents are rare among small players. Another reason may be that there is relatively little jurisprudence covering design patents, as compared to utility patents. Enforcing a design patent (unless it is so iconic and necessary to the success of a company) is complicated when compared to trademark and trade dress assertions.

Hence, on average, a small participant has less than one (0.83) design patent in its portfolio. All but five of the small participants (89%) have no design patents at all. The rare small participants that do have design patents, such as Control4 and Intertel, have a collection of design patents. Not surprisingly, Control4 and Intertel are manufacturers of hardware for end-users. Control4 manufactures smart-home equipment<sup>47</sup> and Intertel makes business phones<sup>48</sup> as well as other types of end-user products for businesses. One unincorporated inventor, Michael Townsend, has only design patents in his portfolio for touchscreen user interfaces. Interestingly, design patents may be seen as an inexpensive benefit. One respondent to the survey indicated that his company was considering applying for a design patent because they are “inexpensive and potentially useful.”<sup>49</sup> That company, despite being a hardware business with 80% of its patents related to smartphones, has no design patents currently.

Of additional note, the data does not indicate any significant hindrance for small participants from utility patent maintenance fees. Patent fees are generally not high<sup>50</sup> and the majority of lapsed patent maintenance fees do not appear to be the result of financial difficulties. Companies appear to allow some of their patents to lapse while preserving others in their portfolios. This makes sense if patents generally have a value greater than the cost of the

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<sup>46</sup> This relationship appears to persist as companies grow their overall portfolio of patents. *See supra*, Table 16 and accompanying text.

<sup>47</sup> *See* CONTROL4, <http://www.control4.com/> (last visited Oct. 31, 2014).

<sup>48</sup> *See* INTERTEL PHONES, <http://www.intertel-phones.com/> (last visited Oct. 31, 2014).

<sup>49</sup> Survey response.

<sup>50</sup> *United States Patent And Trademark Office Fee Schedule*, USPTO, <http://www.uspto.gov/web/offices/ac/qs/ope/fee010114.htm> (last visited Oct. 18, 2014).

maintenance fees.<sup>51</sup> Other companies appear to choose to move their businesses in a different direction. Some instance of lapsed fees for profitable companies may simply be due to oversight or clerical error.

### C. Smartphone Patents and Funding

#### 1. Analysis

The overwhelming majority of the corporate entities among the small participants were founded during or after 2000.<sup>52</sup> The relationship, thus, between patents and funding for small participants may provide an important indicator of the openness of the smartphone market.

The data shows that 29 (or 63%) of the sample participants received some form of funding over the period studied including 17 entities that received at least one series of venture or “angel” funding.<sup>53</sup> On average, these small participants had 1.41 patents granted and 4.45 patents filed before their first funding event. After the final round of funding, 79% of these participants (23 of the 29) stopped filing for patents. Indeed, after the final round of funding, the average number of patent filings for all participants was only 0.79 patents per participant. Table 18 shows the relationship between patents and the first and last funding events.

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<sup>51</sup> Patents can lose value if they are found - either through litigation, due diligence, or by other contact from an interested party - to be unenforceable. Some companies may also choose to dedicate their patented technologies to the public.

<sup>52</sup> Of the 40 corporate entities in the data set, 70% (28) were founded after 2000. By contrast, many of the key large participants in the 2012 Smartphone Patent Study were incorporated many years earlier:

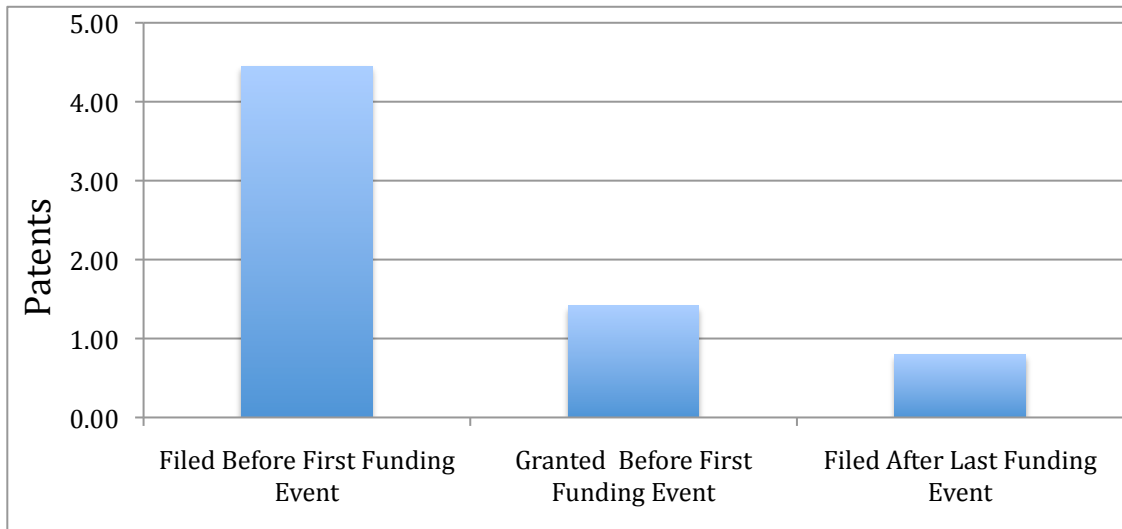
Research in Motion	1984
Apple	1976
Samsung	1938
Microsoft	1975
Nokia	1871
Google	1998
Motorola	1928
Sony	1946
Huawei	1987
Broadcom	1991

Of the 28 companies in the sample that only came into existence in the year 2000 or later, 18 received some form of funding during the period studied (64.3%). Of the 12 corporate entities that less than 10 years old, 7 received funding (58.3%).

<sup>53</sup> The data shows similar results for the subset of small participants that are truly small companies and not larger companies that have small forays into the smartphone market. Of the companies that registered as small companies, 15 (51.7%) received some form of funding.

**Table 18**

Average Number of Smartphone Patents



Patent prosecution, though, seems to pick up during the periods between funding events, in particular right before the first funding event and before an exit event. The companies that received funding showed an average of 2.4 patent filings during the six months before a funding event and 4.7 patent filings during the twelve-month period before a funding event. At least one patent application was filed by 37.9% of the companies six months before a funding event and 44.8% of the companies filed at least one patent application within the twelve months prior to a funding event. Participants that received funding filed fewer patent applications after the events with an average of 1.9 patents during the six months after a funding event (with 34.5% filing at least one patent) and an average of 3.3 patents during the year after (with 51.7% filing a patent).

Table 19 presents the patent filings of each small participant in relation to the timing of the funding events.

**Table 19****Patents Before Exit Event<sup>54</sup>**

	Number of Patents Granted Before Exit Event	Number of Patents Granted Before Previous Event	Difference
Airwalk Communications	9	4	5
Augme Technologies, Inc.	2	-	-
Bitstream Inc.	3	-	-
Cellemetry, LLC	0	0	0
Cequint, Inc.	4	4	0
Control4 Corporation	22	20	2
Core Mobility, Inc.	16	-	-
Cortina Systems, Inc.	21	1	20
Daylife, Inc.	2	0	2
Inter-Tel, Inc.	5	-	-
LiveWire Mobile, Inc.	1	1	0
Nethra Imaging Inc.	2	0	2
Newport Media, Inc.	60	7	53
PureDepth Inc.	0	-	-
SIRF Technology, Inc.	27	0	27
StarHome GmbH	11	0	11
Strix Systems, Inc.	7	4	3
Ubinetics Ltd.	2	0	2
Varia Mobil LLC	4	-	-
Veveo, Inc.	27	1	26
XG Technology, Inc.	27	5	22
<b>Average</b>	<b>16.14</b>		<b>11.7</b>

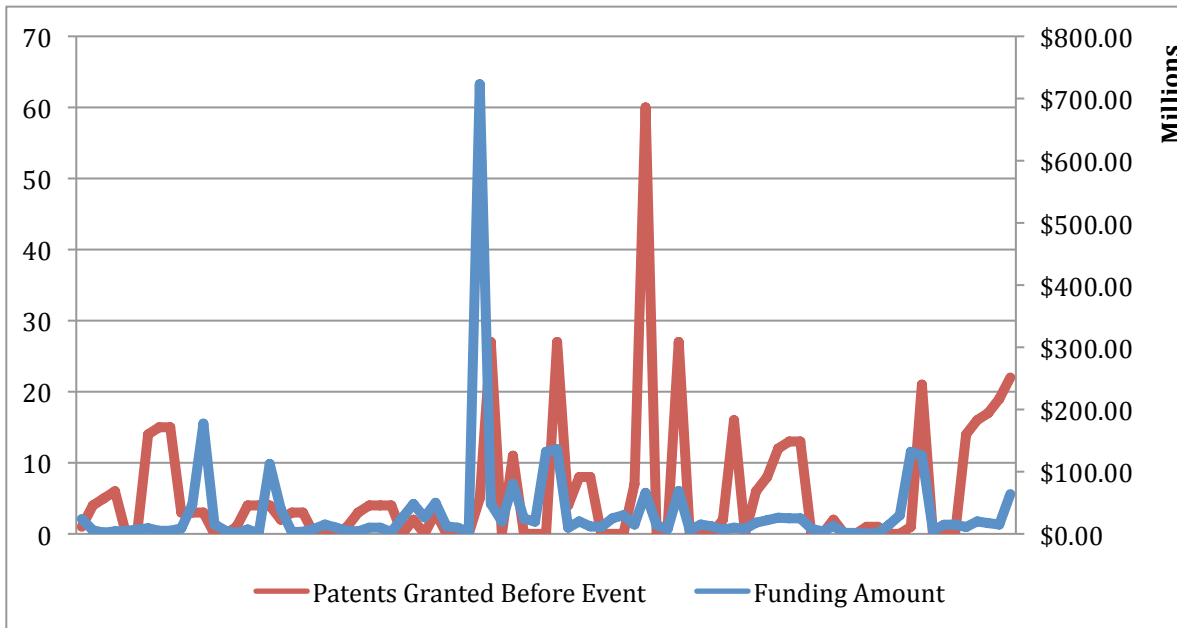
For exit events, nearly a majority of the small market participants in the sample, 22 (48%), experienced an exit event (either by acquisition or by initial public offering). On average, these 22 companies had 15.4 patents filed before the exit event occurred. The above data shows a run-up to obtain a larger number of patents right before the exit event. Companies that had a regular funding event prior to their exit event acquired, on average, another 11.7 patents shortly before they were acquired or went public.

<sup>54</sup> A “-” indicates that there was no previous event; the acquisition or IPO was the only funding event for this participant.

While increases in the number of patents correlate to funding and exit events, the amount of money raised by those events does not correlate to the number of patents. Table 20 below shows that the funding amount and the number of granted patents before that event rarely move together. The correlation is very weak at 0.127. This correlation means that 1.6% ( $0.127^2$ ) of variance between the funding amount and the number of patents is related.

**Table 20**

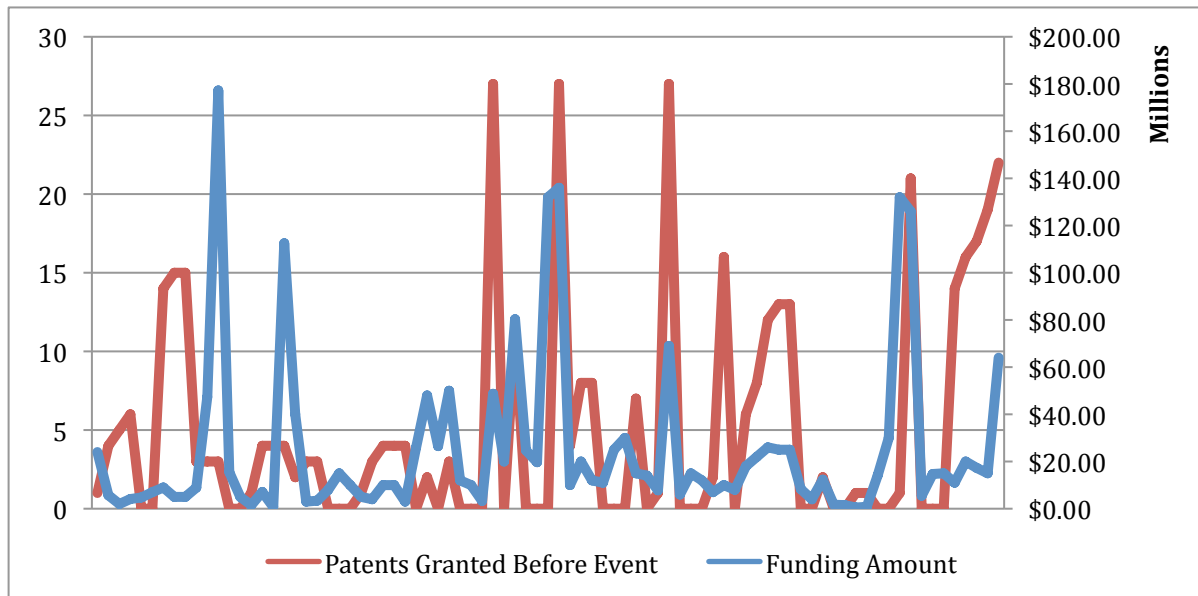
Correlation Between Funding and Smartphone Patents



There are, however, two very clear outliers: one a very high number of patents and one a very high funding amount. If the two outliers are removed, the correlation improves but only slightly as illustrated in Table 21 below. Without these outliers, the correlation coefficient is 0.312 (9.7% of variance is related); this does not indicate meaningful correlation.

**Table 21**

**Correlation Between Funding and Smartphone Patents Excluding Outliers**



The r correlation improves slightly to 0.192 when patent filings are considered rather than patent grants. With the two outliers removed, the r correlation between the amount of funding in respective funding events and the number of patent filings before those events is 0.41, another weak correlation coefficient.

Also, the amount of funding that a company received does not appear to be a function of a company’s age. A regression analysis of all 85 recorded funding events shows no correlation between age and amount. The R square was very weak at 0.014.. However, an outlier (a funding amount of \$732mm) caused the statistical significance to fall below a reliable threshold. With the outlier funding event removed, the statistical significance of the regression was restored and the R square rose slightly to .084 which is still a weak correlation. The age of a company, thus, does not appear to be a good predictor for the amount of funding the company will receive.

## 2. Impact

The data shows that small participants in the smartphone market with patents significantly outperform startups in general in their fund-raising success.<sup>55</sup> According to one

<sup>55</sup> According to a Money Tree study, venture capitalists entered only 3,995 deals totaling about \$29 billion in 2013, an increase of 7% over the previous year. Jeffrey Davidson, Laura Cruz, *Annual venture*



study, 0.5% of startups receive venture funding and 0.91% of startups receive angel funding.<sup>56</sup> In our sample, 63% received funding totaling \$2.8 billion. In every measure we used to isolate the truly small companies from the small participants in the market that were actually part of large organizations, the data still showed more than half of the entities with smartphone patents receiving some form of funding. Moreover, 50% of our sample received more than one round of funding; and split between the 29 companies that received funding, the funding received averaged \$96,551, which exceeds the startup industry average of \$78,406.<sup>57</sup>

As our data showed, a company's ability to build its smartphone patent portfolio determines the company's ability to raise funds but not the amount of funds raised in each round. Though there is no causal relationship between the number of patents and the amount of funding, the companies' actions show that they perceive this connection between patents and funding. The data also shows that age alone does not correlate with higher (or lower) funding amounts. The sample companies exhibited a common pattern in timing for prosecuting patents.<sup>58</sup> The companies in the sample began to build patent portfolios, then sought funding, and then had an opportunity to operate in the market or merge with larger companies. Between funding rounds, companies increase their patents filings. According to the data, the small participants typically increased their acquisitions of patents at a significant level beginning 12 months before obtaining funding. This indicates that patented innovation increases a company's ability to survive in the marketplace. After their final funding event (an acquisition, or an IPO), companies then significantly reduce their smartphone patent filings.

This trend among the small participants indicates that the patent right serves as an important asset for small participants to enter the smartphone market. The patent right appears to strengthen the small participants' existence and to strengthen the small participants ability to compete for necessary funding. The small participants also perceive the patent right as an important signaling marker for the company. Of the 40 corporate entities in our sample, 25 (62.5%), mentioned patents somewhere on their own website.<sup>59</sup> This also indicates that companies value their patent portfolio as a means to entice interest from customers or investors.<sup>60</sup>

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*investment dollars rise 7% and exceed 2012 totals*, PRICE WATERHOUSE COOPER (Jan. 17, 2014), <http://www.pwc.com/us/en/press-releases/2014/annual-venture-investment-dollars.jhtml>.

<sup>56</sup> Laura Entis, *Where Startup Funding Really Comes From*, ENTREPRENEUR (Nov. 20, 2013), <http://www.entrepreneur.com/article/230011>.

<sup>57</sup> *Id.*

<sup>58</sup> *See supra*, Tables 20 and 21

<sup>59</sup> This percentage does not include the unincorporated inventors; 6 companies had no patent info and 8 websites were down or otherwise unavailable.

<sup>60</sup> Anecdotally, it also seems that seeking investment is a top reason for seeking patent rights. One survey respondent noted that the most important impact of smartphone patents on his business was the "[a]bility to negotiate with much more powerful business entities." One survey respondent indicated that it used its patents only "when seeking funding" for the business and had sought funds more than 10 times in the last three years. That respondent had never asserted infringement of its patents, in or out of court or used its patents in advertisement for customers. The other survey respondent stated that his or her company used smartphone patents only to in seeking investments and in informal assertions (e.g. cease and desist letters) against competitors.

Acquisitions also give circumstantial evidence that patent rights provide access to market presence for small participants. For example, three of our selected companies were bought by larger organizations. CSR-- a large UK-based semiconductor company-- bought SiRF (a participant in our sample) for \$136 million in stock. SiRF was a very active innovator and held 305 patents of which 83 were smartphone patents. CSR also bought Ubinetics (another sample participant) for \$48 million in cash. Ubinetics was a less active innovator and only held 12 patents of which 3 were smartphone patents. The third company, Intertel, was acquired by Mitel for \$723 million. At the time of the acquisition, Intertel had a total of 33 patents of which 13 were smartphone patents. The patent rights appeared to be significant components of the acquisition strategies for all the companies involved.

Lastly, the finding that companies ceased filing for patents following the last funding round may be attributed to a variety of factors. The companies may simply have stopped innovating and shifted focus to other areas such as product manufacturing, customer acquisition and retention or sales. Alternatively, the companies might be switching to a trade secret-based business model once certain financial thresholds were reached. Or companies may begin to file under other names once they have sufficient financial stability such as through the name of a patent holding subsidiary. And, it may also be possible that once financial stability is established, companies simply begin purchasing patent rights from others rather than generating new patentable inventions from within. Finally, the reduction in patent filings may be less pronounced than the data indicate. This is due to the possibility that the data may be incomplete if some companies changed their names after they were acquired or if the entities themselves acquired another company. Nevertheless, there is a marked and unexplained slowdown in patent acquisition even among companies that are still functioning under the same name.

## **D. Typology of Litigation**

### **1. Analysis**

In total, the 46 selected small participants were parties in 60 lawsuits – 32 as plaintiffs and 28 as defendants. Thus, in terms of litigation, the average entity saw 1.3 suits with 35% of the companies involved in one or more public lawsuits.

Few of these suits, however, involved patents and even fewer involved smartphone patents. The total number of patent-related suits for all the companies was 38. Yet, those suits were concentrated among 10 small participants and the remaining 36 participants (78%) were not involved in any patent litigation.<sup>61</sup> Of the 10 companies that were involved in some form of patent litigation, all but one are still functioning or have been acquired. On average, the small participants had less than one (0.83) suit each. Only 6 of the companies were defendants in a patent suit.<sup>62</sup> Of the 23 suits where our sample companies were plaintiffs, only 4 of the suits

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<sup>61</sup> See *supra* Part III.E (35% of small companies have no suits of any type.)

<sup>62</sup> The following 6 companies from the sample were defendants in a patent litigation:– 1) Wisair; 2) SiRF Tech; 3) Strix Sys.; 4) LiveWire Mobile; 5) Augme Tech.; and 6) Control4. The following 13 companies were plaintiffs in litigations adverse to the above defendants: 1) Broadcom; 2) Global Locate; 3) Linex

asserted smartphone patents.<sup>63</sup> Of the 15 suits where our sample companies were defendants in patent litigation, 12 included one or more patents with a smartphone patent classification, all of which were in the “communications” category.<sup>64</sup>

Several of the small participants in this study brought patent infringement claims against large companies, including some identified in the 2012 Smartphone Patent Study as “key” participants. For example, Nonend Inventions N.V. sued Spotify (a music services company that had 3 million paying users at the time) for infringement of Nonend’s patents covering content streaming.<sup>65</sup> Another small player, Cequent, Inc. sued Apple for infringement of Cequent’s patents covering advanced caller identification technology.<sup>66</sup> Augme Technologies, Inc. sued Yahoo, Pandora, and others for infringing on Augme’s patents covering a process for adding functionality to a web page.<sup>67</sup>

Of the 6 small participants in the smartphone market that were defendants in patent litigation, three were registered with the USPTO as large corporations<sup>68</sup> and three as small

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Tech’s.; 4) Callertone Innovations; 5) LucidMedia Networks; 6) Velti; 7) Sipco; 8) Lutron; 9) US Ethernet Innovations; 10) Olivistar; 11) Inncom Intl; 12) Azure Networks; and 13) Tri-County Excelsior Foundation. We did not undertake the qualitative and subjective determination of whether the patents asserted against our sample were closely enough related to the smartphone industry. However, from a high level analysis, most of the patents were closely related with assertions of GPS, data communications, and caller ID patents.

<sup>63</sup> The following 7 companies from the sample were plaintiffs in a patent litigation: 1) Nonend Inventions; 2) Cequent; 3) StarHome; 4) SiRF Technology; 5) Veveo; 6) Augme Tech.; and 7) Varia Mobil.

<sup>64</sup> See *supra* III.B, Tables 3-5. *Linex Technologies v. Motorola, Inc., et al* (9:05-cv-80300); *Global Locate, Inc. v. SiRF Technology, Inc. et al* (4:06-cv-06964); *Lutron Elecs. Co. v. Control4 Corp.*, (2:06-cv-00401); *Global Locate v. SiRF Tech, Inc.* (ITC Inv. No. 337-TA-602); *Broadcom Corporation v. SiRF Technology Inc* (8:08-cv-00546); *Inncom Intl Inc v. Control4 Corp* (3:09-cv-00649); *Broadcom Corporation v. CSR plc et al* (8:10-cv-01662); *Callertone Innovations LLC v. United States Cellular Corporation et al* (1:11-cv-01068); *Sipco, LLC v. Control4 Corp*, (1:11-cv-0612); *Azure Networks LLC et al v. Samsung Telecommunications America LLC et al* (6:12-cv-00745); *U.S. Ethernet Innovations, LLC v. Cirrus Logic, Inc.* (6:12-cv-00366); *Wilan, Inc. v. Apple Inc.* (3:14-cv-01507).

<sup>65</sup> *Nonend Inventions NV v. Spotify USA Inc. et al*, RPX, <https://search.rpxcorp.com/lit/dedce-51308-nonend-inventions-nv-v-spotify> (last visited Oct. 18, 2014); Dawn McCarty, *Spotify Sued by Nonend Over Technology for Music Sharing*, BLOOMBERG (Aug. 17, 2012 12:06 PM), <http://www.bloomberg.com/news/2012-08-17/spotify-sued-by-nonend-over-technology-for-music-sharing.html>.

<sup>66</sup> *Cequent Inc. v. Apple Inc.*, RPX, <https://search.rpxcorp.com/lit/dedce-47651-cequent-v-apple> (last visited Oct. 18, 2014); Wolfgang Gruener, *Cequent Sues Apple Over Advanced Caller ID*, TOM’S GUIDE (Dec. 14, 2011 8:00 AM), <http://www.tomsguide.com/us/patent-infringement-lawsuit-apple-iphone,news-13503.html>.

<sup>67</sup> *Augme Techs., Inc. v. Tacoda LLC* (1:07-cv-07088) (Tacoda was in the middle of being acquired by AOL when this lawsuit was filed); *Augme Techs., Inc. v. Yahoo!, Inc.* (3:09-cv-05386); *Augme Techs., Inc. v. Pandora Media, Inc.* (1:11-cv-00379); *Augme Techs., Inc. v. Gannett Co.* (1:11-cv-05193); *Augme Technologies Inc. v. Velti USA Inc.* (1:12-cv-00294); *Augme Technologies Inc. v. Millennial Media Inc.* (1:12-cv-00424).

<sup>68</sup> See *supra* note 12.

ones.<sup>69</sup> These three “small” participants, Augme Technologies, Control4, and Strix Systems, are now fairly large successful companies, though some with only small smartphone-related ventures. Augme Technologies, for example, acquired Hipcricket and now, operating under that name, reported revenue of \$7.3 million in the first fiscal quarter of 2014.<sup>70</sup> Though currently operating at a deficit, Hipcricket does not appear to fault patent litigation for any of its losses and in fact lists patent litigation as an asset in its public filings.<sup>71</sup> Control4 has over 300 employees and generated revenue of \$109.5 million in 2012.<sup>72</sup> Strix systems in 2007 held the top two positions in the number of nodes and radios shipped in terms of both revenues and market share.<sup>73</sup> One of the six defendants among the small participants in the sample, Wisair Ltd., seems to be no longer functioning,<sup>74</sup> while the other five are either active or acquired.<sup>75</sup>

Non-practicing entities are largely absent from litigation involving the small participants.<sup>76</sup> Of the 12 plaintiffs who brought smartphone patent law suits against the small participants in our sample, 5 were listed by RPX as NPEs.<sup>77</sup> Of those few sample participants that were involved in litigation with a NPE (8.7%), all but one were named as co-defendants in a suit where the primary defendant was a large corporation, including Apple and Samsung.<sup>78</sup> The companies that defended patent infringement suits against a NPE also tended to have large portfolios of patents themselves.<sup>79</sup>

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<sup>69</sup> See *supra* note 18.

<sup>70</sup> Hipcricket, Inc., Quarterly Report (Form 10-Q) 12 (July 20, 2011), available at <http://a.aug.me/augmeimg/44000/43235.pdf>. (Augme/Hipcricket has brought patent infringement actions against AOL, Time Warner Cable, and Yahoo Inc.).

<sup>71</sup> *Id.* at 11.

<sup>72</sup> Control4, INC., <http://www.inc.com/profile/control4> (last visited Oct. 18, 2014).

<sup>73</sup> *News Spotlight*, STRIX SYSTEMS, <http://www.strixsystems.com/newsspotlight.aspx> (last visited Oct. 18, 2014).

<sup>74</sup> Azure Networks and Tri-County Excelsior Foundation added Wisair and several other technology companies as defendants to an amended complaint in a lawsuit initially brought against Samsung. Though Wisair was named as a defendant, there is no indication that the lawsuit had any meaningful impact on Wisair's ability to function or contributed to Wisair's demise. Even if this one litigation were damaging to Wisair, it would stand alone as an outlier in our study as the only company so adversely affected by smartphone patent litigation.

<sup>75</sup> These observations were made as of October 2014.

<sup>76</sup> Non-practicing entities (NPEs) involved in patent litigation are identified by RPX and listed in the database of litigations status was determined by reference to the RPX database of annotated litigations: available at <http://www.rpxcorp.com/>.

<sup>77</sup> 1) Azure Networks; 2) Linex Technologies, Inc.; 3) Callertone Innovations; 4) Sipco; and 5) U.S. Ethernet Innovations.

<sup>78</sup> *Sipco, LLC v. Control4 Corp* (1:11-cv-00612); *Olivistar, LLC v. Control4 Corporation* (2:14-cv-00393).

<sup>79</sup> The following 4 companies from the sample were sued by an NPE for alleged infringement of smartphone patent: 1) Wisair; 2) Strix Systems; 3) LiveWire Mobile; and 4) Control4.

Of the 46 small participants in the sample, two (4.3%) were identified as an NPE themselves.<sup>80</sup> Both of these companies initiated patent lawsuits against very large companies, but not against other small players.

In all, only 6.5% of the small participants were sued for patent infringement by an operating company. There is also only one instance of a large actor identified in the 2012 Smartphone Patent Study suing a small participant.<sup>81</sup>

## 2. Impact

Patent litigation itself does not seem to be a major threat for small participants in the smartphone field. Twenty-two percent of the small participants in our sample were involved in patent litigation at some point from their inception through October 2014. However, of those only half (11%) of the small participants were named as defendants in a suit where a smartphone patent had been asserted. And of those 5 companies, only two (4%) were named as a defendant directly while the others were named as co-defendants in a suit where the primary defendant was a large corporation.<sup>82</sup> With regard to NPEs the data is similar, with only one member out of 46 from the sample facing an NPE directly in patent litigation. This data does not indicate that these lawsuits adversely affected any of the small participants' ability to function in the smartphone market.<sup>83</sup> The data does suggest, however, that a strategy of amassing a defensive patent portfolio would be unnecessary. Neither large industry players nor non-practicing entities appear to have much of an interest in suing small participants for patent infringement.

By contrast, there are several instances where small participants have used their patents against large companies as a method of obtaining compensation for their innovations.<sup>84</sup> On the reverse side, some litigation appears to result in the acquisition of the defendant. For example, Bitstream was acquired by Monotype imaging, which had previously sued Bitstream for patent infringement. Likewise, in the midst of litigation with Broadcom, SiRF was acquired by the much larger semiconductor company CSR. This acquisition was not directly related to the

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<sup>80</sup> The following 2 companies in the sample were identified by RPX corp. as NPEs: 1) Nonend Inventions; and 2) Augme Techs.

<sup>81</sup> Broadcom sued a relatively small market participant – SiRF – for patent infringement related to GPS. SiRF was a semiconductor manufacturing company. Broadcom later named SiRF in another patent lawsuit against CSR, a much larger semiconductor company which had acquired SiRF.

<sup>82</sup> *Global Locate, Inc. v. SIRF Technology, Inc. et al* (4:06-cv-06964); *Global Locate v. Sirf. Tech, Inc.* (ITC Inv. No. 337-TA-602); *Lutron Elecs. Co. v. Control4 Corp.*, (2:06-cv-00401); *Broadcom Corporation v. SiRF Technology Inc* (8:08-cv-00546); *Inncom Intl Inc v. Control4 Corp* (3:09-cv-00649); *Sipco, LLC v. Control4 Corp* (1:11-cv-00612); *Olivistar, LLC v. Control4 Corporation* (2:14-cv-00393).

<sup>83</sup> No company publicly attributed any financial difficulties to patent litigation.

<sup>84</sup> *See e.g., Veveo, Inc. v. Verizon Services Corp. et al* (case no. 1:10-cv-06709); *Cequint Inc. v. Apple Inc.* (case no. 1:11cv01224); *Augme Technologies Inc. v. Pandora Media Inc.* (case no. 1:11-cv-00379); *Augme Techs., Inc. v. Yahoo!, Inc.*, 2012 U.S. Dist. LEXIS 151 (N.D. Cal. Jan. 3, 2012); *Augme Techs., Inc. v. AOL Inc.*, 2012 U.S. Dist. LEXIS 88463 (S.D.N.Y. June 20, 2012); *Varia Holdings LLC v. Samsung Electronics Co, LTd.* (case no. 1:12-cv-01899); *Veevo, Incorporated v. Comcast Corporation et al* (case no. 1:13-cv-11885); *Nonend Inventions NV v. Spotify USA Inc. et al* (case no. 1:13-cv-00389); *Starhome GmbH v. AT&T Mobility LLC*, 743 F.3d 849 (Fed. Cir. 2014).

litigation as the purchase was part of a strategy for CSR to become “a connectivity centre for everything from bluetooth to FM radio, GPS and near-field communications.”<sup>85</sup>

## V. OPENNESS OF THE MARKETPLACE

The relationship of patents to the openness of the smartphone market for small participants is, like that of large participants, difficult to isolate. The trends in three areas provide insight for the assessment of openness of the smartphone market to small participants: A) market access; B) market exit; and C) litigation.

### A. Access to the Market

The findings show that patents in the smartphone field provide access to the market for small players. Whether the ease of access is equivalent for small market participants that do not hold any patents, the data here demonstrates that a portfolio of smartphone patents increases the likelihood of survival, of being funded, acquired, or going public. The sample of patent holding companies with a small presence in the smartphone market showed a very high rate of survival or successful exit, well above the average for small tech companies in general. Though not an absolute requirement to do business, obtaining a patent covering smartphone innovations does seem to help considerably in gaining access to funding.

The research affirms that patents provide credibility to small participants with respect to investors. One reason may be that patents are expensive to prosecute and the existence of a patent demonstrates access to capital and a willingness to invest in the company’s future (on average the companies had filed 4.45 patents before their first funding event<sup>86</sup>). This credibility may explain why a small entity in the smartphone field with patents has a disproportionately high probability of being funded and surviving.

The research shows a very large portfolio of patents is not necessarily better than a small one. A company with just a few patents greatly increases its access to the market through funding and a company with 10 or more patents substantially increases its likelihood of survival.<sup>87</sup> Beyond 10 patents, no meaningful increase was observed in the ability to survive and there is no meaningful correlation between the number of patents and the amount of funding received.<sup>88</sup> This is important with respect to entry costs. The cost of obtaining a professionally drafted and prosecuted U.S. patent is somewhere between \$5,000 and \$20,000.<sup>89</sup> Therefore, the cost of obtaining several patents is not prohibitively high for a small commercial enterprise. If a

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<sup>85</sup> Maija Palmer, CSR seeks out acquisitions, *Financial Times*, Oct. 27, 2009.  
<http://www.ft.com/cms/s/2/b23392ea-c321-11de-8eca-00144feab49a.html>

<sup>86</sup> *See supra* IV.C.1.

<sup>87</sup> *See supra* Table 17.

<sup>88</sup> *See supra* IV.B.1 (Table 17) and IV.C.1.

<sup>89</sup> Paul Chang, *The Costs of Obtaining Patent Protection*, WOLVERINE STARTUP LAW (Apr. 15, 2014), <http://www.wolverine-startuplaw.com/2014/04/15/the-costs-of-obtaining-patent-protection/>.

very large portfolio of patents were required for survival and funding, the legal and filing fees could be considered a substantial barrier to entry. For example, if small companies needed a defensive portfolio to respond to large participants' infringement assertions that were designed to quash competition, the cost of entry might be prohibitive. This study did not observe such a barrier.

Small participants, though, focused on the communications segment of the market. The findings show that the vast majority (80%) of smartphone patents produced by the small players are communications patents.<sup>90</sup> Software is the second in line with 12%, design is a low 6%, and hardware represents only 2% of patents in our data set.<sup>91</sup> The low rate of hardware and design patents might be explained by the costs of reducing an invention to practice. For hardware, expensive machinery may be needed to build prototypes of hardware. This may change in the near future with the proliferation of 3D printing. Design patents are usually for consumer products and our small players rarely have a consumer-facing product. Instead, they sell their products to other businesses that then include them in a consumer product.

The low number of software patents as compared to communications patents is more difficult to explain because the process of creating software and new communications methods is closely related. This might be explained by the confusing jurisprudence surrounding the enforceability of patents on software. The Supreme Court has in essence stated that software patent claims need to be limited to a commercial embodiment.<sup>92</sup> Another possible explanation is that prosecuting and enforcing communications patents may be perceived as easier.

## **B. Exit**

A successful "exit" is the hallmark of the venture capital world<sup>93</sup> and represents an open market if both access and exit options exist for small participants. For an investor, the "exit" goal is to make a profit on the invested capital. Exit may occur by an internal buy-out of early investors, by another company's acquisition of the organization, or by the company offering shares to the public on a stock market.

The small participants with smartphone patents fare very well in terms of their potential for an exit. Of the 40 companies represented among the 46 small participants sample, 15 (37.5%) exited through a successful acquisition event. Another 4 (10%) offered shares publicly on a stock exchange.<sup>94</sup> This is a very high percentage showing that there are readily available exit options along with investor confidence in those businesses holding patents with a small

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<sup>90</sup> See *supra* Table 13.

<sup>91</sup> *Id.*

<sup>92</sup> See *e.g.*, *Bilski v. Kappos*, 561 U.S. 593, 593 (2010); *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2347(2014).

<sup>93</sup> See *e.g.* *Exit Strategy*, INVESTOPEDIA, <http://www.investopedia.com/terms/e/exitstrategy.asp> (last visited Oct. 31, 2014); Nicole Gravagna, Peter K. Adams, *Venture Company Exit Options*, DUMMIES, <http://www.dummies.com/how-to/content/venture-company-exit-options.html> (last visited Oct. 31, 2014).

<sup>94</sup> Data regarding the internal buyout of investors was not publicly available. Companies that went public are - 1) PureDepth; 2) Augme; 3) XG Technology; and 4) Control4.

presence in the smartphone market. The patents, thus, appear to serve as a valuable asset for small participants.

But as with funding in general, there is no meaningful correlation in the research results between the amount of money generated by an exit event (an acquisition or an IPO in this study) and the number of patents. Thus, while a smartphone patent portfolio may be helpful to secure a successful exit, there is no indication that a large portfolio with many patents is necessary for a small market participant to survive successfully.

### C. Litigation

Few patent holders seem interested in suing the small players in the smartphone field for patent infringement. With two exceptions, the small participants were not the targets of any oppressive costly litigation brought by competitors.<sup>95</sup> To the contrary, small participants sued large industry players for patent infringement more often than the other way around. And the few study participants that were the subject of patent litigation campaigns had already grown large enough to absorb those costs on their balance sheets by the time of that litigation, as demonstrated by the research results relating to market longevity.<sup>96</sup> In addition, NPEs do not appear to target small participants. This study found only one example when a small market participant was sued as a primary defendant by a NPE for infringement of a smartphone patent.<sup>97</sup>

The relatively low instance of patent litigation may be due to cost. According to a study performed by the American Intellectual Property Law Association (AIPLA) in 2013, the costs of patent litigation are extremely high.<sup>98</sup> Table 22 below illustrates these costs. Expenses can run as high as \$2.8 million for disputes where the amount in controversy is between \$1 million and \$25 million. Disputes that exceed \$25 million more than double that cost with an average of \$5.9 million. And disputes of \$1 million or less cost on average almost \$1 million through trial, a cost that often exceeds the amount at stake.

**Table 22**

Costs of Patent Litigation Generally<sup>99</sup>

Amount in Controversy	Cost through Discovery	Cost through Trial
<\$1mm	\$530K	\$970K
\$1mm - \$10mm	\$1.2mm	\$2.1mm
\$1mm - \$25mm	\$1.7mm	\$2.8mm

<sup>95</sup> One company closed its doors following patent litigation, Wisair, Ltd., but the suit did not appear as the reason Wisair ceased to exist.

<sup>96</sup> See *supra* IV.A.1 and IV.D.1.

<sup>97</sup> Sipco, LLC v. Control4 Corp (1:11-cv-00612); Olivistar, LLC v. Control4 Corporation (2:14-cv-00393); See also *supra* IV.D.1.

<sup>98</sup> 2013 Report of the Economic Survey, AIPLA,

<http://www.aipla.org/learningcenter/library/books/econsurvey/2013EconomicSurvey/Pages/default.aspx> (last visited Oct. 31, 2014).

<sup>99</sup> *Id.*



\$10mm - \$25mm	\$2.2mm	\$3.6mm
>\$25mm	\$3.6mm	\$5.9mm

When an NPE sues a company for patent infringement, the cost of litigation is slightly lower.<sup>100</sup>

While the threat of costly patent infringement litigation might be used to create a significant barrier to entry, the cost-benefit analysis makes it unlikely that a small participant will actually be sued. The benefits for plaintiffs may be limited. According to Price Waterhouse Cooper’s annual litigation trends report, the most prevalent measure of damages for patent infringement is a reasonable royalty.<sup>101</sup> Reasonable royalties are typically calculated as a percentage of revenue made on a product that embodies an infringed patent and that would have resulted from a hypothetical licensing negotiation.<sup>102</sup> This means that even with a hypothetical royalty as high as 10%, a small target company would need \$10 million in revenue just from infringing products for a plaintiff to recover the costs of bringing the lawsuit.<sup>103</sup> While the Price Waterhouse Coopers’ study further indicates that median damages are the largest in the telecommunications field compared to the 9 other fields examined,<sup>104</sup> this does not seem to be enough to justify the high cost of litigation or the long time to trial (median time to trial for an NPE is 2.5 years with a 25% success rate and the median time for a practicing entity is 2.28 years with a 35% success rate). Even if a plaintiff is able to secure a sufficiently high judgment, there is no guarantee that the small market participant will be able to pay. The high cost of patent litigation, the inability to shift costs to the loser, and the low potential for high damages may actually be keeping offensive litigants from stifling small players.

For some of the large market participants, restraint in litigation may be a strategic choice for good will. If a large player begins suing all its potential competitors to eliminate them from the industry, they may receive backlash from their own customers or from a government agency. One survey participant explained that the first mover advantage – being the first with a new product on the market – as opposed to patent assertions is the best way to protect a company’s place in the market. It is also a difficult task to convince a jury and the public that a large corporation suing a small entity is not a bully.

Lastly, cease and desist letters might pose threats to small participants. These letters inform an adverse party of the existence of one or more patents and of the patent owner’s intent

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<sup>100</sup> *Id.* This slight reduction in cost is likely due to the fact that NPEs, by their nature, have no competing business to permit a countersuit and counter-discovery.

<sup>101</sup> 2014 PWC Study, *supra* note 2 at 13.

<sup>102</sup> *See* TWM Mfg. Co. v. Dura Corp., 789 F.2d 895, 898-99 (Fed. Cir. 1986).

<sup>103</sup> Moreover, jury trials yield much higher damages than bench trials and are used much more often in patent trials, especially in the telecommunications industry. 2014 PWC study, *supra* note 80, at 15. But small companies are known to play the bully card if a larger company or a non-practicing entity brings a patent infringement suit. These facts combined with the high costs likely discourage patent litigation against small players in the smartphone field, (and likely in other fields as well). This may explain why large market participants in the smartphone space and non-practicing entities choose not to assert patents against small players in court.

<sup>104</sup> 2014 PWC Study, *supra* note 2 at 13.

to assert their rights. This in turn triggers several legal doctrines. It helps ensure that the patent owner does not lose the right to enforce the patent in the future.<sup>105</sup> A letter that specifies a patent also provides notice to the target company-- a requirement for a claim of willful infringement, which can significantly increase damages. A widespread letter campaign could extract costly licensing fees from some of the targets that fear litigation and its high costs. But a cease and desist letter campaign may have a weak effect if litigation is not seen as a real possibility. The high cost of litigation, the low likelihood of recouping those costs from a small company, and the low instance of observed litigation against small companies may undercut the threat to small market participants of cease and desist letters. However, we have no way of measuring the actual effect of cease and desist letters such as licensing fees paid to avoid claims.<sup>106</sup>

The data shows that patent litigation does not seem to be a barrier to entry in the smartphone field. The common perception that small companies are being stifled by unscrupulous, unfair, and overburdening litigation is not supported by our data for the smartphone market.<sup>107</sup>

## VI. CONCLUSION

Patents are an important tool for small players entering the smartphone market. With a few patents, small participants gain access to the market through financing that results from their increased attractiveness to investors as compared to the startup industry in general. The ability to obtain a number of patents also enhances small participants' ability to survive and to effect a successful market exit. This means that entry and exit are enhanced by small participants' patent holdings. Patent litigation, whether from operating companies or NPEs, does not appear as a significant concern for small players and does not appear to pose barriers to entry. These are all positive indicators that patent rights are providing incentives for innovation among entry participants and small industry players.

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<sup>105</sup> For instance, the doctrines of collateral estoppel or laches prevent a patent holder from laying in wait while a company builds an entire business around a patented invention and then pouncing on them to demand their revenue years later. *See e.g. Ashe v. Swenson*, 397 U.S. 436, 436 (1970).

<sup>106</sup> Our review of press releases from the companies did not provide any information about cease and desist letter campaigns and we had insufficient survey responses to draw information.

<sup>107</sup> Loek Essers, *'Patent Trolls' Cost Tech Companies \$29 Billion Last Year, Study Says*, PC WORLD (June 27, 2012), [http://www.pcworld.com/article/258395/patent\\_trolls\\_cost\\_tech\\_companies\\_29\\_billion\\_last\\_year\\_study\\_says.html](http://www.pcworld.com/article/258395/patent_trolls_cost_tech_companies_29_billion_last_year_study_says.html).

**APPENDIX A**  
**List of Selected Small Participants in the Smartphone Market**

Airwalk Communications, Inc.  
Altair Semiconductor, Ltd.  
Augme Technologies, Inc.  
Beyer Jr, Malcolm K (Individual Inventor)  
Bitstream, Inc.  
Carrier IQ, Inc.  
Cellemetry, LLC  
Cequint, Inc.  
Control4, Corp.  
Core Mobility, Inc.  
Cortina Systems, Inc.  
Daylife, Inc.  
Exphand, Inc.  
IncNetworks, Corp.  
Intertel, Inc.  
Interstate Electronics, Corp.  
ISP Operator Corp.  
iTechTool, Inc.  
Kauffman, George M (Individual Inventor)  
KD Secure, LLC  
Knapp, Ronald P (Individual Inventor)  
Legend Silicon Corp.  
LiveWire Mobile, Inc.  
Nethra Imaging, Inc.  
Newport Media, Inc.  
NexStep, Inc.  
Nonend Inventions, N.V.  
Octasic, Inc.  
ORO Grande Technology, LLC  
PureDepth, Inc.  
Salmon Technologies, LLC  
Samhain Inion, LLC  
SiRF Technology, Inc.  
StarHome, GmbH.  
Strix Systems, Inc.  
Sudharshan, Srinivasan (Individual Inventor)  
Tensorcomm, Inc.  
Townsend, Michael L (Individual Inventor)  
Ubinetics, Ltd.  
Varia Mobil, LLC  
Veveo, Inc.  
Viktor, Kaptelinin (Individual Inventor)  
Wisair, Ltd.  
Wmode, Inc.  
Xcerion, Ab.  
XG Technology, Inc.

## APPENDIX B

### Fordham CLIP Smartphone Small Business Survey

#### Welcome.

Thank you for participating in our survey. Your responses will have a meaningful impact on this study to assist the WIPO in its ongoing work in international intellectual property law and innovation policy.

We will NOT collect identity or IP address information when you take this survey. This survey is anonymous and your responses will only be used in statistical summaries unless you specifically indicate otherwise below and choose to reveal your identity. It would be helpful to this study if you reveal your identity. If you do, you may be invited to attend an event where this study will be discussed by leaders in IP policy-making and smartphone innovators.

#### \* 1. Please indicate whether you may be identified with your responses.

- I may be identified with my responses.
- My responses may be quoted anonymously.
- My responses may only be used in statistical summaries.

#### 2. What is your organization's name? (optional)

#### 3. What is the survey taker's name? (optional)

#### 4. What is the survey taker's title? (optional)

#### 5. What type of business does your company primarily do? (check all that apply)

- Hardware
- Software
- Communications technologies (for instance, 4G LTE or NFC)
- Design

## Fordham CLIP Smartphone Small Business Survey

**6. Approximately what percentage of your company's business is related to smartphones?**

- 0%
- 10%
- 50%
- 80%
- 100%

**7. Approximately what percentage of your company's patent portfolio is related to smartphones?**

- 0%
- 10%
- 50%
- 80%
- 100%

## Fordham CLIP Smartphone Small Business Survey

### 8. Which of the following business strategies does your company use?

	Currently doing	Currently planning to do	Currently considering	Has rejected	Never considered	Unable to Respond
Seeking investments for your company	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Investing in other companies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leveraging smartphone-related patents for an IPO, buyout, or merger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Licensing smartphone-related patents to other parties	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Licensing smartphone-related patents from other parties	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cross licensing smartphone-related patent portfolios	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patent pooling of smartphone-related patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Selling smartphone-related patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buying smartphone-related patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Donating smartphone-related patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asserting smartphone-related patents against others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An alliance, partnership, or joint venture other than a patent pool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Fordham CLIP Smartphone Small Business Survey

### 9. In deciding whether to apply for a smartphone-related patent, which of the following does your company consider important?

	Very Important	Important	Moderately Important	Of Little Importance	Unimportant	Unable to Respond
Patent Office fees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attorney fees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Broad legal protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Validity of the patent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excluding competitors from the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preventing others from excluding your company from the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strategic portfolio building to access a market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strategic portfolio building to protect a market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to generate licensing income streams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attracting investors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

## Fordham CLIP Smartphone Small Business Survey

**10. Please indicate the ways in which your company has used or encountered smartphone-related patents over the last three years.**

	Never	1 to 3 Times	More than 3 Times	More than 10 Times	Unable to Answer
Sent a letter to a third party asserting infringement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Received a letter from a third party asserting infringement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filed a patent infringement complaint against a third party	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Had a patent infringement complaint filed against your company	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Used your patents in advertisement to customers or potential customers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Used your patents when seeking funding for the business	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please add any comments here about how any of the activities in the question above have affected your business (optional)



# Fordham CLIP Smartphone Small Business Survey

## 11. Has your company ever...

Yes	No	Unable to Answer
<b>considered applying for a design patent related to smartphones?</b>		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Why or why not? (optional)		
<input style="width: 100%;" type="text"/>		
<b>decided not to patent a smartphone-related invention it considered patentable?</b>		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Why or why not? (optional)		
<input style="width: 100%;" type="text"/>		
<b>abandoned a smartphone-related patent or patent application?</b>		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Why or why not? (optional)		
<input style="width: 100%;" type="text"/>		
<b>decided not to pursue someone whom you believed was infringing one or more of your smartphone-related patents?</b>		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Why or why not? (optional)		
<input style="width: 100%;" type="text"/>		
<b>filed or threatened to file a patent infringement suit related to a smartphone patent?</b>		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Why or why not? (optional)		
<input style="width: 100%;" type="text"/>		

## 12. Rate the following in terms of importance for your company's smartphone-related inventions.

	1 (most important)	2	3	4 (least important)
First mover advantage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patenting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Secrecy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limiting reverse engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Fordham CLIP Smartphone Small Business Survey

**13. Is your company aware that the U.S. Patent and Trademark Office offers discounts to small and micro organizations?**

- Yes  
 No  
 Unable to Respond

**14. Please enter the total number of smartphone-related patents in your company's portfolio that...**

have been granted by the USPTO	<input type="text"/>
are utility patents	<input type="text"/>
are design patents	<input type="text"/>
are up to date on maintenance payments	<input type="text"/>
have been applied for	<input type="text"/>
have been purchased	<input type="text"/>
have been sold	<input type="text"/>
have been licensed out	<input type="text"/>
have been licensed in (from a third party)	<input type="text"/>

**15. In managing your company's smartphone-related patents for the last three years, how often did you do the following tasks?**

	Never	Once	Between 1 & 3 times	More than 3 times	More than 10 times	Unable to Respond
Inventoried your patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appraised (or had appraised) your patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewed third party patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewed third party products or services for infringement of your patents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Held patent-strategy related meetings of the Company's decision makers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Fordham CLIP Smartphone Small Business Survey

### 16. How much capital has your company devoted to smartphone-related patent acquisition?

	\$0 - \$50,000	\$50,001 - \$150,000	\$150,001 - \$500,000	\$500,001 - \$1,000,000	More than \$1,000,000	Unable to Respond
In the last 12 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last 3 years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the first 3 years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### 17. In the next 12 months, you expect this number will...

- Increase
- Decrease
- Remain the same

### 18. How much revenue has your company generated through the licensing of smartphone-related patents?

	\$0 - \$50,000	\$50,001 - \$150,000	\$150,001 - \$500,000	\$500,001 - \$1,000,000	More than \$1,000,000	Unable to Respond
In the last 12 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last 3 years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the first 3 years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### 19. In the next 12 months, you expect this number will...

- Increase
- Decrease
- Remain the same

### 20. How much revenue has your company generated through the sale of smartphone-related patents?

	\$0 - \$50,000	\$50,001 - \$150,000	\$150,001 - \$500,000	\$500,001 - \$1,000,000	More than \$1,000,000	Unable to Respond
In the last 12 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last 3 years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the first 3 years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### 21. In the next 12 months, you expect this number will...

- Increase
- Decrease
- Remain the same

## Fordham CLIP Smartphone Small Business Survey

**22. Has your company ever been threatened with litigation regarding a smartphone-related patent by a....**

**(check all that apply)**

- big company?
- small company?
- patent troll?
- patent assertion entity?
- direct competitor?
- indirect competitor?
- someone else? (please specify)

**23. Has your company ever sent a cease and desist letter related to smartphone patents to a...**

**(check all that apply)**

- big company?
- small company?
- patent troll?
- patent assertion entity?
- direct competitor?
- indirect competitor?
- someone else? (please specify)

**24. Name your company's top three competitors (optional)**

1

2

3