

## Analyzing Patent Characteristics and Business Strategies of Non-Practicing Entities

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**Abstract**--The operation of non-practicing entities (NPEs) has been denounced, the influences of NPEs are more and more significant on the economy, society and technology. The objective of this paper is to characterize patents owned by selected famous NPE corporations. A total of 12 NPEs with 4,947 utility patents are analyzed in this paper from four aspects: (1) country, (2) industry, (3) corporates, and (4) valuation assertion. Moreover, in the valuation assertion section, 11 patent characteristics are used as indicators for evaluating NPE patents. This paper also compares the degree of patent value among NPE patents, litigated patents and ITC patents in the most significant 6 patent characteristics. One important finding is that NPE patents are verified as more valuable patents than litigated patents and ITC patents. However, No. of patent citation received (also called No. of forward citation; CI), does not show positive relation as other patent indicators do. In summary, this paper offers three major contributions: (1) using 4,947 NPE patents from 1976 to 2012 as sample patents, (2) measuring NPE patents value by 11 patent characteristics and (3) showing that NPE patents are more valuable than litigated patents and ITC patents.

### I. INTRODUCTION

The number of patent litigation increases dramatically over the past several decades [2][3]. From 1976 to 2012, more than 30,000 patents are involved in litigation in the U.S. In general, there are two ways for firms to protect their competitive advantages, i.e. one is to file patent litigation suit in the court, and the other one is to How to File an ITC Action in Patent Cases. The latter one might have relatively more severe sanction than the former one. A possible sanction is, e.g., to ban importing to the U.S. In a knowledge economy, a patent is to protect intellectual capital, so if a patent involved in infringement or in ITC investigation, it is believed that the value of the patent should be higher [4]. It is not unusual for a type of companies to strategically file patent litigation or ITC action intentionally to collect licensing fees through settlement of the above two type patent infringements. The type of companies, usually called non-practicing entities (NPEs) or "Patent troll", plays an important role in the game of patent litigations and ITC infringement. It is, therefore, believed that patents owned by NPEs must be valuable enough for NPEs to file patent litigation or ITC investigation action strategically.

To allow better understanding on the field of patent litigation or ITC investigation, several important terms, i.e. Non-Practicing Entity, Litigated Patent, ITC Patent, and Patent Value are discussed in details.

#### A. Non-Practicing Entity

Non-practicing entity (NPE), a firm without producing or manufacturing any product but at least owns one patent right

to collect licensing fees from practicing entities. Also, there are three main characteristics of this firms. First, the firm adopt a series of patent evaluating process, such as economic appraisal, legal evaluation, and technological essentiality. Secondly, they buy or gain patents by other firms mostly instead of creating patents by their own. Thirdly, human capital is more valuable than physical capital. If the firm earn their profit by using patent litigation for unreasonable licensing fees and compensation as its main business model, this kind of firms has named as some negative terms like "Patent troll" or "Patent sharks". The phenomenon of NPEs is more and more important in recent years, and it arises scholars' interest researches on this issue. e.g., one paper [3] used cases study to find out typologies of the NPEs, and they believed that only non-innovative/non-manufacturing and owned trivial /non-trivial patents firms are patent trolls. Hence, universities are NPEs, too, but universities are different from patent trolls. The latter usually, a) collect reasonable licensing fees, and b) universities will not hide their patents information but welcome for technology authorization. A study [5] views a NPE as broker which releases asymmetric information condition in the patent market. Various members, attorneys, economists and engineers form at least one or several teams in NPE firm. The team member's task is to evaluate a patent real value, i.e., economic value, legal value and technology value, and how the patent can satisfy or intimidate different customers' needs in patent market. As a NPE obtains patents, those team members evaluate the patent value in three aspects, economics, legal, and technology in detail. After the whole patent evaluating process, the NPE acknowledged the patent withhold what kinds of value more. In other words, a firm owns patents not merely for technology consideration, but economics, legal or other considerations. NPEs indeed have the abilities as excellent brokers in some cases. However, NPEs would hide their patent information as possible as they could to bargaining good patent deals. Hence, NPEs are also criticized about inappropriate behavior of causing some bad effects in society, such as declining the speed of innovative technology[6][7][8]. In addition, some of manufacturing or practicing entities are not willing to adapt the technology owned by NPEs for preventing to pay huge licensing fees. Comparing to other entities, NPEs are more actively in filing patent litigation. It is, therefore, believed that patents owned by NPEs must be valuable enough for NPEs to file patent litigation or ITC investigation action strategically. "How valuable NPE patents are?" is the core theme in this paper. So, this paper used 11 patent characteristics as the signs showing the patent value, and the same research method which was published by paper [9] and paper [10]. In order to

demonstrate the value of NPE patents, this paper also used two different classifications of patents, litigated patent and ITC patent, as comparing objects. The degree of patent value among these three patent classification is displayed in the result section. More details of litigated patents and ITC patents are demonstrated in the following context.

#### *B. Litigated Patent*

An infringed patent is a valid indicator as a valuable patent. Thus, litigated patents are valuable than non-litigated patents. In recent years, litigated patents has become more important in modern society, because patents are viewed as unavoidable competitive advantage in competitive business market, e.g., patents can block rivals to get the lead time and provide more legal protection. The more infringements a patent involved, the more valuable it is. The patent characteristics between litigated patents and non-litigated patents are fundamentally different [4]. There are numerous literatures evaluating a patent's value by the litigation possibilities of real option [11], fuzzy method [12] [13], or combination of both [14]. The global fiercely competitive business activities make enterprises seek more strategies to consolidate or improve market shares, and using the legal-based business strategies prevent competitors from stepping into the market. Hence, a litigated patent has been used as strong evidence of patent value. The paper [13] used the whole utility patents from the USPTO database to find important patent characteristics between litigation and non-litigation patents from 1976 to 2010, and there are six of eleven patent characteristics showed more prominent as demonstrating the value of litigated patents. The result of litigated patent figures from paper [13] are cited in this paper as one of the comparing objects.

#### *C. ITC Patent*

ITC Patent means that a patent was investigated by International Trade Commission (ITC, U.S.). The U.S. International Trade Commission is a quasi-judicial federal agency of government, and ITC devotes on unfair trade investigation. The ITC judgment process is different from the lawsuit in court; e.g., 1) the ITC judgment process is more quickly, and it must be terminated whole investigations in 18 months (12 months in average). 2) ITC only focuses on import commodities, and only Office of Administrative Legal Judge and Office of Unfair Import Investigations in whole judgment process without jury. 3) President can reject ITC judgment. In addition, 4) As a ITC investigation is in process, the defendant's commodities cannot import to U.S.. Moreover, there is no compensation even if the defendant's intellectual propriety rights has its legitimacy usage. Hence, the ITC sanction is more powerful and strong than the sanction in court. Besides, ITC deals with cross-border patent infringements, so its influence and significance are playing an important position on international trade and global economy. In other words, the influence of ITC is broader and strong than the court. A study [15] also published a research to

disclose the patent characteristics differences between ITC patents and non-ITC patents. The paper [15] used the utility patents of the USPTO database from 1976 to 2012 to demonstrate the patent value of ITC patents by 11 patent characteristics. Also, in paper [15], there are six of eleven patent characteristics showed more prominent as demonstrating the value of ITC patents. The result of ITC patent figures from paper [15] are cited in this paper as one of the comparing objects.

#### *D. Patent Value*

Leveraging, enforcing, extending and using the value of patents are important in every level of organizations, such as country, corporate and research group in a knowledge economy. Since patent is a key indicator of innovative capacity in any levels organization, identifying a patent's value is important [16]. There are more and more patent indicators used to analyze rigorous business competition for patent-based asset portfolio or market value assertion [17]. Those patent indicators or various patent analysis results can assist firm owner to develop business strategies or enhance patent portfolios for competing in harsh market [3]. In order to evaluate value of patents, paper [18] offered various patent indicators as the signals of patent value, i.e. patent age, forward citation, backward citation, patent family size, technological range, number of claims, etc [19] [20]. Patent as one of the important documents for protecting intellectual property in a knowledge economy plays a very significant role in an infringement [21]. So, if a patent gets more easily involved in patent infringement, the more valuable the patent it is [4]. Patent infringement contains two types of litigation, litigated patents and ITC patents. [15] demonstrated a model to obtain evidence-based patent valuation in terms of ITC patents, and ITC patent is has more legal value truly. In general, valuable patents have some specific features, such as more claims, forward citation and backward citation [4]. One paper [28] found that most-litigated patents have positive relation with higher market value. Also, the study [25] found that a 10% rise in the number of claims (1.0 claim at the mean) implies a 1.4 percentage point increase in the sample litigation, and one additional forward citation per claim raises the probability of an infringement suit by 22%. Hence, Correlation between the patent infringement and patent value is very strong and visible.

Patent value concludes three perspectives; i.e., 1) Legal value. Patent is a legal document with exclusive right fundamentally, it is to prevent the IPR (intellectual propriety right) from infringements from imitators or competitors. Thus, the empowerment of its legitimacy from Office is the most basic value of patent [22][23][24][25][26][27][28][15], if a market is very crucial, they would likely to apply for filing patent litigation to enhance their competitive advantages. Secondly, 2) Technology Value. A patent document includes abundant technology information. So, if a technology is very essential in one area, the technology owner would be willing to apply for patent document for

legal protection[29][30][31]. Since the patent is essential in one technology area, following applying patents must cite the patent. Hence, patent documents also could be very powerful analysis elements to depict the trend of technology. A patent document concludes the cited patents, and numerous patents are cited or citing in relating area. The connection between cited patents and citing patents can illustrate the network of its technology relation and knowledge flow chart. 3)Economic Value, [32][33][34][35][36][37]. Paper [38] and paper [19] discuss the evaluation of the three values by different indicators.

NPE becomes an emerging issue in recent years, and it also attracts many scholars do research in this issue [39]-[40]. However, most of researches are focus on the famous case study to demonstrate the effect of NPEs, or analyzing patents data in small period to demonstrate some picture of NPEs. Hence, this paper is going to offer another view of NPEs in Quantitative Methods by analyzing 1976 to 2012 patents. This paper dose not discuss the NPEs’ behaviors or their effects in recent years, but discloses the value of NPE patents in macro view interestingly. Actually, “How valuable the NPE patents are?” is the most core theme in this paper. Are those NPE patents valuable enough to shock or damage the rules in patent mechanism? So, this paper would compares among the litigated patents, ITC patent and NPE patents in 11 patent characteristics to support the theme of this paper. Following three question will be answered: 1) is patent owned by NPEs valuable? 2) Are these patents hold by NPEs more valuable than the litigated patents or ITC patents? 3) if so, how valuable the NPEs patents are?

Hence, this study seeks to use patent characteristics with clear figures to depict what NPEs really are. Also, this study also fill the research gap by using statistic tools to analyze 4,947 utility patents issued by USPTO from 1976 to 2012 which could provide a macro view to look at NPEs activities. Last, this study will compare litigated patent, ITC patent and NPEs patents by 11 patent characteristics to demonstrate how valuable the NPEs patents are and interesting findings.

## II. RESEARCH METHOD

There are 4,947 utility NPE patents founded in USPTO from 1976 to 2012, and these patents would be analyzed by 11 patent characteristics which is supported by [10] and [15] for patent value assertion. In this section, the 11 patent characteristics and the data source of 12 NPEs list would be explained in detail. Moreover, table 2 demonstrates that several academic literatures support the authenticity of relative 12 NPEs.

### A. Patent Characteristics as Patent Indicators

This paper used utility patents data which were downloaded from USPTO since 1976, and there are totally 4,389,348 utility patents until 2012. Firstly, this paper adapted the same research method from paper [10] and paper [15] and retrieved 14 patent characteristics from patent document can be seen obviously, which are also defined as variables of patent: 1) Patent Number, 2) Application Year, 3) Issue Year, 4) No. of Assignee, 5) No. of Assignee Country, 6) No. of Inventor, 7) No. of Inventor Country, 8) No. of Patent Reference, 9) No. of Patent Citation Received, 10) No. of IPC, 11) No. of UPC, 12) No. of Claim, 13) No. of Non-Patent Reference, 14) No. of Foreign Reference. Secondly, those variables does not relate to patent value and patent infringement such as 1) Patent Number, 2) Application Year, 3) Issue Year, were eliminated because of no evidence shows contribution to this study. Finally, there are just 11 variables are remained to analyze in this paper. Table 1 shows relative literatures supporting for the 11 patent characteristics.

One assumption has been tested: significant differences can be observed between NPEs patents and non-NPEs patents, and this study also conducts descriptive statistics, two sample T-test. But the relative figures of ITC patents and litigated patents were sourced from paper [10] and[15] as the comparing objectives of NPE patents.

### A. NPEs & Shells List

The clear boundary between NPEs and non-NPEs is hard to examine, but there is a consensus of existing or phenomena of NPEs in academics, industries and companies. This paper views NPEs as brokers in patent market fundamentally.

TABLE 1. LITERATURES FOR THE 11 PATENT CHARACTERISTICS USED IN THIS STUDY.

No.	Characteristics	Literatures
1.	No. of Assignee	[18][41]
2.	No. of Assignee Country	[42] - identified whether or not cross-country (At least 1 foreign inventor)
3.	No. of Inventor	[43][41]
4.	No. of Inventor Country	[42] - identified whether or not cross-country (At least 1 foreign applicant)
5.	No. of Patent Reference	[44][44][45][46][4][3] [29][26][47][48]
6.	No. of Patent Citation Received	[49][50][25][46][51][4][26][3][48][52]
7.	No. of IPC	[53][45][46][54]
8.	No. of UPC	[54]
9.	No. of Claim	[25][18][55][4][26][52]
10.	No. of Non-Patent Reference	[56][57][46][58][59][60][29][47]
11.	No. of Foreign Reference	[46][60][29]

Sourced from: [10]

Hence, a firm complies with the following definition are viewed as one of the analysis elements in NPEs pool. That is: **those kinds of entities without manufacturing any products which utilize patent rights to earn unreasonable patent licensing fees or make economic rent from suing companies or manufacturers except for universities.** So, this paper dose not focus on the various terms of NPE, such as patent troll, patent sharks, non-practicing entities or patent assertion entities, but focus on the purified definition of NPE. In other words, a firm owns patents but no implementation of manufacturing or producing and files at least a patent infringement to the practicing entities for the licensing fees on purpose.

These 12 NPEs list was cited from IP Checkups Website [61]. IP Checkups is a company offering patent analysis service and suggesting some patent portfolios to customers. Website information can be separated into three sections, Patent Assertion Entities, Defensive Patent Aggregators and Academic/ Research Entities. In each sections, there are some relative companies and its shells. This study only used the data from Patent Assertion Entities, and Defensive Patent Aggregators. This paper did not put Academic/ Research Entities section into NPEs patent analysis pool, because Academic/ Research Entities have significant difference between patent Assertion Entities/NPEs [62], e.g., a) the academic/research entities do not hide their patents, and b) most academic/research entities offer fair license agreements to provide valuable know-how which speed up technology transfer [28]. The motivation of academic/research entities patents are totally owned in different concepts, e.g., the nature of engaging in entity, non-profit operation and profit operation. So this paper denies to put academic/research entities patents into NPEs analysis pool.

IP Checkups. Website notes that some of their data were sourced from Plainsite.org[63], especially for one the NPE firm, Intellectual Ventures Company (IV). Plainsite.org is an online legal database dedicated to bringing patents information transparency in the legal system, so many NPEs and its related shells listed on the website. The blog of Plainsite.org [64] is one of the relative information channels of Plainsite.org, and more details of the methodology, e.g., how Plainsite.org get the NPEs related source, can be found at Plainsite.org blog. For instance, IV and its shell companies list are sourced from [65] which is a journal from Harvard. Therefore, in order to make the NPE list more objective and authentically, this paper also used some academic literatures to support the NPE list from IP Checkups & Plainsite.org. Table 2 shows the academic literatures support relative 12 NPE companies, and these 12 NPEs' related shell companies are put in Appendix.

*B. The Way of Dealing with Shell Companies*

NPEs actually seldom used its brand or title name to involve in patent infringement, but established relative shells to manage the patent infringements. One of the NPEs common strategies is to set up a lot of shell companies to

make its patent portfolios veiled in the public. Take IV for instance, according to [65] research, the author predicted that IV at least has 1200 shell companies and at least 40,000 patents if combines all its shell companies. Moreover, IV is just one of the famous NPEs, needless to say there are numerous NPEs all over the world and related shell companies. So, it is impossible to identify all the NPEs and related shells, at least in this stage, but those important NPEs should be disclosed as many as possible. Hence, this study picked up some famous NPEs according to the frequencies showed up in the academic literatures, and also selected some important shell companies of these well-known NPEs, e.g., the shell companies which is in management position or connect home company frequently. However, those shell companies do not really record in the same country and some of them are foreign companies actually, so the writing type of corporation is not inconsistent. The recorded owner name of company in a patent document can be separated two parts, company name and abbreviation of corporation &company, such as Limited Liability Company and Ltd. In order to avoid typing error and search nothing in patent database because of the different writing types of the abbreviation part, this study wipes out the second part (abbreviation of corporation, or company) and just only remain the first part, the company name. Take Acacia Media Technology Group, Disc Link Corporation and Rambus Delaware LLC these companies for instance, this study wipes out "Group", "Corporation" and "LLC" part. So this study search Acacia Media Technology Group by the keyword of "Acacia Media Technology", Disc Link Corporation by the keyword of "Disc Link" and Rambus Delaware LLC by the keywords of "Rambus Delaware". Appendix can view NPEs and shell companies used in details.

TABLE 2 NPES LIST AND SUPPORTING LITERATURES

1.	<b>NPE Name</b>	<b>Acacia</b>
	<b>Literatures support</b>	[39][66][67][68][62][69][70][71]
2.	<b>NPE Name</b>	<b>Intellectual Ventures</b>
	<b>Literatures support</b>	[72] [72][67][73][6][67][62][75][7][76]
3.	<b>NPE Name</b>	<b>Inter Digital</b>
	<b>Literatures support</b>	[77][78][79][80][81][21][82]
4.	<b>NPE Name</b>	<b>Mosaid</b>
	<b>Literatures support</b>	[83][84][85][86][87][88][89]
5.	<b>NPE Name</b>	<b>Rambus</b>
	<b>Literatures support</b>	[90][91][92][93][83][20][20][94][95][96]
6.	<b>NPE Name</b>	<b>Rock star</b>
	<b>Literatures support</b>	[97][85][98] [99] [100]
7.	<b>NPE Name</b>	<b>Round Rock</b>
	<b>Literatures support</b>	[85][101][102][91][103][88][40]
8.	<b>NPE Name</b>	<b>Tessera</b>
	<b>Literatures support</b>	[104][105][106][107][101][108]
9.	<b>NPE Name</b>	<b>Walker Digital</b>
	<b>Literatures support</b>	[28][103][85][107][109]
10.	<b>NPE Name</b>	<b>WI-LAN</b>
	<b>Literatures support</b>	[83][107][85]
11.	<b>NPE Name</b>	<b>RPX</b>
	<b>Literatures support</b>	[103][80][110][102][98][111][112][106]
12.	<b>NPE Name</b>	<b>Allied Security Trust</b>
	<b>Literatures support</b>	[106][110][113][114][88][115]

III. RESULTS

A. Overview NPEs activities

There are 4,389,348 utility patents issued by USPTO from 1976 to 2012, and 4,984 NPE patents are founded in this paper, including 111 litigated patents in NPE patents. Also, there are 36,905 litigated patents and 1,305 ITC patents founded. The share rate of litigated patents in utility patents is 0.84%, the share rate of ITC patents in utility patents is about 0.30% and the share rate of NPE litigated patents in NPE patents is about 2.2%. Besides, there are 4,975 companies as inventor type, and only 8 are unrecorded in the inventor type. There are three trend curves, No.litigated patents, No.NPE patents and No.ITC patents, display in figure 1. First of all, the No.litigated patents curve shapes like a mountain; the curve straightens up from 1976 until 2000, and it declines steeply since 2000 year. There are 450 litigated patents in 1976 year, 1,891 litigated patents in 2000 year, and 232 litigate patents in 2012 year. Besides, the No.ITC patents curve looks flat: 11 ITC patents are found in 1976 year, the largest amount of ITC patents is 85 in 1999 year and 2001 year, and only 3 ITC patents are found in 2012 year. Moreover, the NPE patents curve increases upward since 1987. There are 4 NPE patents in 1987 year, 199 NPE patents in 2000 year, and 930 NPE patents in 2012 year. Several interesting phenomenon display in fig.1. First, the litigated patents curve and NPE Patents curve does not have positive relation. So, the result matches the Government Accountability Office's (GAO, U.S.) report which presented that NPEs are not the main reason of causing patent infringements. In 2011, there is a cross point in these two

curves, and the NPE patents curve crosses with the ITC curve in 2000. Moreover, the largest amount of litigated patents also appears in 2000 year.

So, there are three interesting finding phenomenon waiting for reasonable explanations: 1) why the litigated patents curve shapes like a mountain, and why there is a turning point appears in 2000 year? 2) Why a cross point appears between NPE patents curves and litigated patents curve in 2011? 3) Why the NPE patents curve and ITC patents curve cross in 2000 years? 4) Why the amounts of the litigated patents and ITC patents become unusual at 2000 years, but not NPE patents? Is there any prominent social changes, such as government regulations, global economic changes in 2000? And if so, why the NPEs can against the prominent social changes? How did these NPEs behave in 2000?

Fig.2 shows the top 5 countries with the largest volumes of NPE patents. The ranking from No.1 (United States) to No. 5 (Luxembourg) is positioned in the X-axis. As fig. 2 showed, United States has more NPE patents hugely than other countries. Some reasons estimated that why United States has more NPE patent: 1)These NPE patents were sourced from USPTO database. Those NPE companies used for patent analysis are United. States based companies mostly, so the NPE companies are more willing to apply patents in United States because of local advantage for gaining United. States. Legal protection. 2)The political situation in United. States is stable and transparent comparing to most of countries, so the game rules of protecting Intellectual propriety are clearly and trust by anyone. 3)The market in United States is huge enough to make companies/NPEs to earn economic rent. In

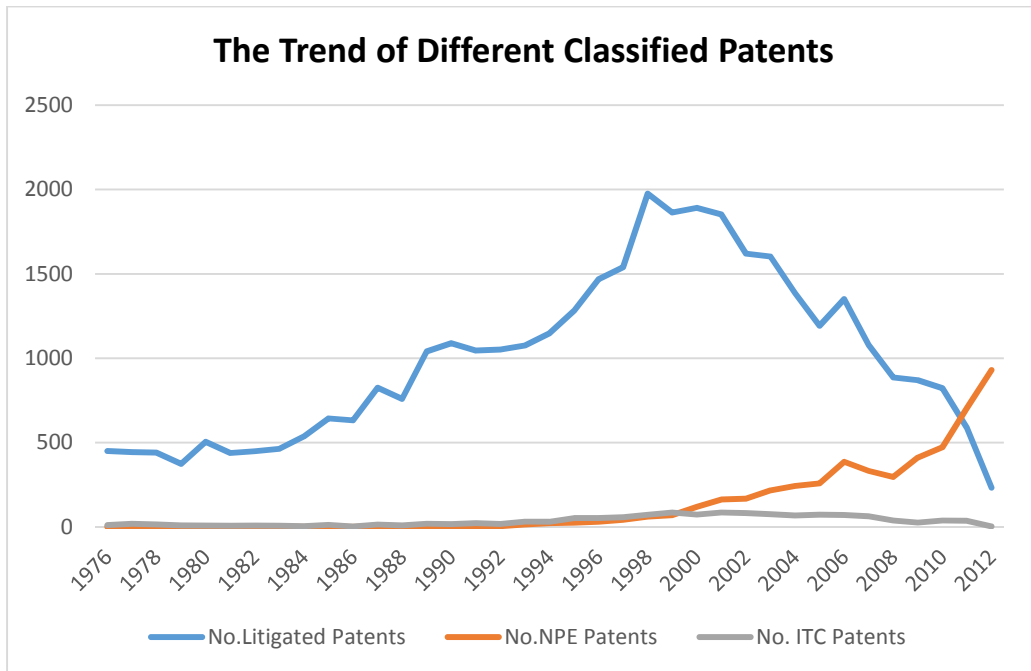


Figure 1 The Trend of Different Classified Patents

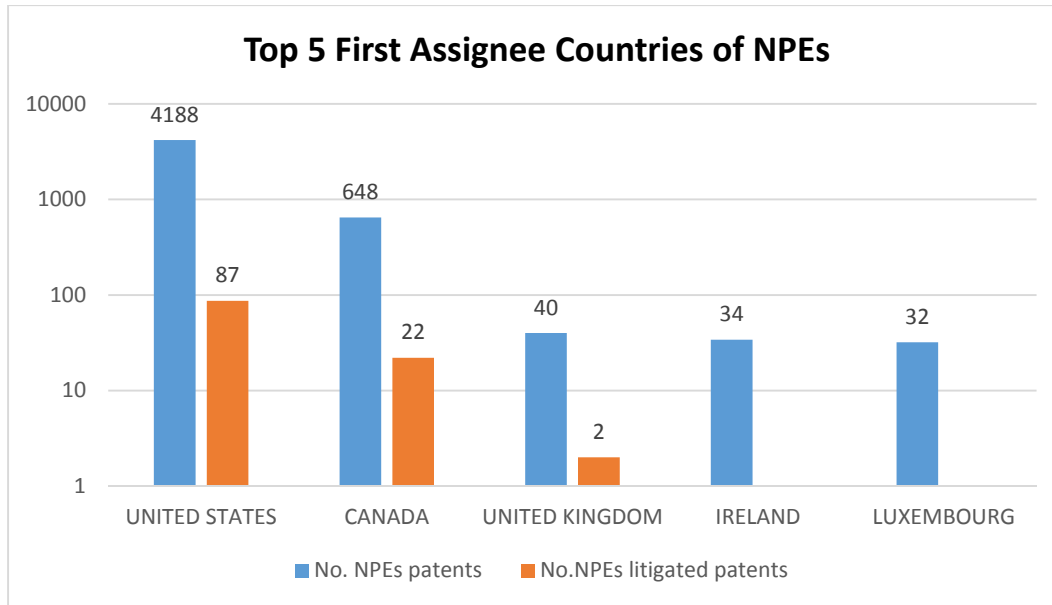


Figure 2 Top 5 First Assignee Countries of NPEs

addition, the effectiveness of patent protection system has positive relation with the first assignee countries of patent. North America area and Europe area have most first assignee countries showed in fig.2. In United Kingdom, there are 31 NPE patents are come from Cayman Island, and only 9 NPE patents are registered in United Kingdom.

Table 3 provides an industry-based overview on NPE litigated patent and non-NPE litigated patents. From table3, NPEs involved in Electrical engineering industry more active than other industries. The Top 5 NPE patents are in Electrical

engineering industry. Also, in the litigated patents column, the Electrical engineering industry has most litigated patents. Electrical engineering litigated patents occupies the biggest portion in 111 litigated patent of NPEs. However, Instruments industry has 14 litigated patents especially in Control subclass. The different rank of NPE litigated patents and non-NPE litigated patents in table 3 provides evidences to show that what industries have more competitive situation in developing intellectual assets.

TABLE 3 TOP 10 NPES PATENTS IN INDUSTRIES.

NPE litigated patents		
Rank	Industry	No. of NPE Litigated Patent
1.	Electrical engineering/Telecommunications	34
2.	Electrical engineering/Computer technology	32
3.	Electrical engineering/IT methods for management	16
4.	Instruments/Control	14
5.	Electrical engineering/Digital communication	4
6.	Electrical engineering/Information technology	3
7.	Other fields/Furniture, games	2
8.	Electrical engineering/Audio-visual technology	1
9.	Instruments/Measurement	1
10.	Electrical engineering/Electrical machinery, apparatus, energy	1
Non-NPE litigated patents		
Rank	Industry	No. of Non-NPE Litigated Patent
1.	Electrical engineering/Telecommunications	1067
2.	Electrical engineering/Computer technology	775
3.	Electrical engineering/Telecommunications	654
4.	Electrical engineering/Information technology	493
5.	Electrical engineering/Basic communication processes	338
6.	Electrical engineering/Digital communication	300
7.	Other field	184
8.	Instruments/Control	147
9.	Other fields/Furniture, games	122
10.	Electrical engineering/Semiconductors	96

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NPE patents grow year after year, and Electrical engineering is the most popular area. So what about every individual NPE patents situation? Table 4 exposes twelve NPEs' patents in five industries, Chemistry, Electrical engineering, Instruments, Mechanical engineering, and other fields. The blank filled in Null means that patents cannot be classified in those five industries. This paper assumes that if a NPE pays more attention on some area for patent portfolios reason, the patent amount would be more in focused industries than un-focused industries. In other words, the more patents in an industries, the more concerned from the NPE is. Although Electrical engineering and Instrument are most popular industries which NPE involved in, every individual NPE's situation is still different. Hence, this paper view these data in two aspects; first one, Acacia corporate, one of the selected NPEs almost hold patents in every industries in average, so maybe Acacia corporate has a solid team with various experts in every industries. If someone wants to do some research related to how to manage patent portfolios, Acacia corporate is a good case study, because it never be easy to manage these patents separated in different industries. The second view is that companies are professional in three or two areas, e.g., Walker Digital is professional in three industries. Rambus is professional in two areas, Electrical engineering, and Instruments.

Table 5, every NPE Patents Involved in Patent Litigation or ITC Patents. This study also views table 5 into two aspects. First, Inter Digital, Mosaid, and Rambus are classified in first group, and Acacia Allied Security Trust, Walker Digital, and Wi-LAN are classified to second group. First group means that NPE patents involved in litigation patent and ITC patent. Shortly, the NPE companies in first group are more valuable than in the NPE companies in second group, because it is hard that a patent involved in both litigation and ITC investigation. According to paper [10], there are just 0.082%

share of whole utility patents involved infringement. Moreover, paper [15] also indicated that ITC patents is more valuable than litigated patents. In other words, researcher can make a deeply case studies of these NPE companies, because these NPE companies are really good at leveraging their patent portfolios and patents value. This paper assumes that the NPEs in first group are having some special business strategies so that these NPEs make excellent performance on legal value perspective. However, one thing needs to remind reader is that maybe those NPEs are not in first group are good at licenses licensing fees negotiation, so those NPEs did not have to take legal actions. In other words, this study concludes that the NPEs in first group are really excellent in patent management, especially at legal actions.

An individual NPE which owns patents involved in patent litigation is separated into second group, and there are Acacia Allied Security Trust, Walker Digital, and Wi-LAN.

Although these NPE patents are not involved in ITC patent, these NPE patents still have the chances to involve in ITC infringement in the future. In addition, these NPEs are maybe the ones who are really good at licenses royalty negotiation, so they do not have to take legal actions. To sum up, it need further research to verify these NPEs' management abilities.

### *B. The Value of NPE Patents*

Table 5 makes a comparison among litigation patents, ITC patents and NPE patents by 11 patent characteristics to acknowledge how valuable NPE patents are. The figures of litigated patent and ITC patent are cited from paper [10] and [15], and both patent data were conducted by Two-sample T-Test, and most of p-value were smaller than 0.0001. The last column, NPE patents, are conducted by Two-sample T-Test, too.

	Acacia	Allied Security Trust	Intellectual venture	Inter Digital	Mosaid	Rambus
Chemistry	20	0	3	0	2	3
Electrical engineering	75	3	122	1522	557	968
Instruments	12	3	8	51	25	54
Mechanical engineering	20	0	0	0	1	0
Other fields	15	2	14	115	5	1
Null	4	0	0	66	2	1
<b>Total patents</b>	<b><u>146</u></b>	<b><u>8</u></b>	<b><u>147</u></b>	<b><u>1754</u></b>	<b><u>592</u></b>	<b><u>1027</u></b>
	Rockstar	Round Rock	RPX	Tessera	Walker Digital	WiLAN
Chemistry	1	3	0	0	0	0
Electrical engineering	141	236	63	67	233	79
Instruments	10	33	1	72	120	5
Mechanical engineering	0	6	0	12	0	0
Other fields	0	1	0	0	138	24
Null	23	0	0	0	2	3
<b>Total patents</b>	<b><u>175</u></b>	<b><u>279</u></b>	<b><u>64</u></b>	<b><u>151</u></b>	<b><u>493</u></b>	<b><u>111</u></b>

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TABLE 5 EVERY NPE PATENTS INVOLVED IN PATENT LITIGATION OR ITC PATENTS						
	Acacia		Allied Security Trust		Intellectual venture	
	No. ULP	No. ITC	No. ULP	No. ITC	No. ULP	No. ITC
Chemistry	0	0	0	0	0	0
Electrical engineering	11	0	0	0	0	0
Instruments	0	0	2	0	0	0
Mechanical engineering	0	0	0	0	0	0
Other fields	0	0	0	0	0	0
Null	1	0	0	0	0	0
<b>Total Patents</b>	<b>12</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>No. ULP=number of U.S Litigated Patents; No. ITC = number of ITC Patents</b>						
	Mosaid		Rambus		Rock star	
	No. ULP	No. ITC	No. ULP	No. ITC	No. ULP	No. ITC
Chemistry	0	0	0	0	0	0
Electrical engineering	15	2	15	12	0	0
Instruments	4	0	0	0	0	0
Mechanical engineering	0	0	0	0	0	0
Other fields	0	0	0	0	0	0
Null	0	0	0	0	0	0
<b>Total Patents</b>	<b>19</b>	<b>2</b>	<b>15</b>	<b>12</b>	<b>0</b>	<b>0</b>
<b>No. ULP=number of U.S Litigated Patents; No. ITC = number of ITC Patents</b>						
	RPX		Tessera		Walker Digital	
	No. ULP	No. ITC	No. ULP	No. ITC	No. ULP	No. ITC
Chemistry	0	0	0	0	0	0
Electrical engineering	0	0	0	0	29	0
Instruments	0	0	0	0	9	0
Mechanical engineering	0	0	0	0	0	0
Other fields	0	0	0	0	2	0
Null	0	0	0	0	0	0
<b>Total Patents</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>0</b>
<b>No. ULP=number of U.S Litigated Patents; No. ITC = number of ITC Patents</b>						
	Wi-LAN		Round Rock		Inter Digital	
	No. ULP	No. ITC	No. ULP	No. ITC	No. ULP	No. ITC
Chemistry	0	0	0	0	0	0
Electrical engineering	4	0	0	0	18	13
Instruments	0	0	0	0	0	0
Mechanical engineering	0	0	0	0	0	0
Other fields	1	0	0	0	0	0
Null	0	0	0	0	0	0
<b>Total Patents</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>13</b>

Firstly, No. of Inventor, No. of Patent Reference, No. of Patent Citation Received, No. of Claim, No. of Non-Patent Reference and No. of Foreign Reference, these 6 patent characteristics are more significant as patent value indicators according to paper [10]and [15]. The bigger the figures in these six patent characteristics, the more valuable the patent it is. Obviously, the figures of ITC patents are bigger than figures of litigated patents in these six patent characteristics. In shortly, ITC patents are more valuable than litigated patents in average. In addition, if a group of patents displays significantly in these six patent characteristics by using two simple T-test, the group of patents is valuable. If one group of patents shows significantly than another group of patents in these six patent characteristics in the same way, the former is more valuable than the latter. Hence, in order to acknowledge how valuable the group of NPE patents are, this study analyzed NPE patents in the same way, and compared NPE patents with ITC patents and litigated patents.

Secondly, From Table 6, all the figures of litigated patents are smaller than the figures of NPE patents in 6 patent characteristics. So this paper assumes that NPE patents are

more valuable than litigated patents in general. However, one thing need to remind that NPEs are one of the instigators of patent litigations. Maybe it is NPEs make their patents more valuable by active legal action. This study does not reject NPEs' manipulation of patent litigations in reality world. On the contrary, NPE patents must qualified enough to arouse the fire of patent litigations. So NPE patents are valuable at least in legal value.

Thirdly, the figures of NPE patents are significant than the figures of ITC patents in these six patent characteristics, except two patent characteristics, No. of Patent Citation Received and No. of Claim. However, in No. of Claim column, the NPE patents figure (23.04) is just slightly smaller than ITC patents figure (24.59). The NPE patent figures are 2.75 of No. of Inventor, 54.54 of No. of Patent Reference, 10.67 of No. of Patent Citation Received, 23.04of No. of Claim, 19.95 of No. of Non-Patent Reference, and 5.68 of No. of Foreign Reference. In No. of Patent Reference and No. of Non-Patent Reference, the two patent characteristics, NPE patents figures are more significant than ITC patents. As purchasing a patent, NPE would evaluate whole patent



document in detail. These two patent characteristics demonstrate how careful NPEs are as they acquire a patent. NPEs take the quantity of patent references and non-patent references into consideration. More references are citing from a patent, the more trustable the patent it is. There are three guys can add references in a patent document; they are patent owner, lawyer and patent examiner. Patent owner puts references in their patent document because of technology factors to make sure the technology in patent document is reliable. Lawyer puts references in a patent document because of the factor of legal value. Lawyer knows how to make a patent document can be protected by regulation completely, so they suggest patent owner put some references for protection by law. As a patent examiner, they try their best on making a patent document completely. So, they would examine related patent documents, scientific literature databases, and other sources in the applying stage. In some situation, patent examiner would ask patent owner to put other related patents as references. Hence, a patent document is examined by patent owner, lawyer and patent examiner thoroughly and each of them can view as a strong recognition of the patent. In other words, references are involved in different concepts of value. A patent displays reliance as citing more references.

However, one patent characteristics, No. of Patent Citation Received, shows different result comparing to other patent characteristics. The figure of NPE patents (10.67) is far smaller than the figure of ITC patents (32.41) and the figure of litigated patents (28.77) in No. of Patent Citation Received. The number of citations a patent has can also be seen to be linked to the market value of the company owning the patent and the value of the technology[60]. A patent's value not only views what patents cite the patent, but also how many patents, which can determine the patent's value status. In addition, No. of Patent Citation Received can also view as the degree of patent importance. Because if a patent withholds essential technology in one area, there should be a lot of patents cite the important patents. It is not straightforward to explain why the results shows so inconsistent in No. of Patent Reference, No. of Non-Patent Reference and No. of Patent Citation Received. Since these three patent characteristics, No. of Patent Reference, No. of Non-Patent Reference and No. of Patent Citation Received have positive relation with a patent value status situation.

Consequently, this study offers two possible explanations and assumptions :

**1)NPE is just a broker :** NPEs earn economic rents just from the trade of patents. Holding a patent with more references can persuade the purchaser believe that the patent is worth to buy. So they do not need to consider the technology essentiality so much, all they need to do just trade off the cost of patent evaluating process and patent evaluation. Besides, patent value combines three concepts of value, technology, economic and legal. Even if NPE patents are not performance well in technology value, maybe NPEs can acquire more economic rents from economic and legal value. Shortly, the high quantity of references and low quantity of patent citations of NPE patents confirm the assumptions that NPE patents withhold more value of legal and economic rather than the value of technology. Because of this phenomenon, this paper do not reject the truth that some of vile NPEs hold trivial patents to intimidate or rob licensing fees from manufacturing firms in reality. That's why NPEs have another notorious names, patent trolls or patent sharks.

**2)Effect of Notorious Names**

From patent owner, lawyer and patent examiner perspectives, NPE patents are not trustable enough to cite in applying patents. The motivation of holding patents from NPEs are too complicated to cite. This study has assumed that legal value and economic value are the main components of NPE patents to make economic rent. Hence if more patents cite from a NPE patent, the holder, NPEs have more bargaining chips to ask patent licensing fees or make a good patent deal. No one would like to increase NPEs bargaining power, so patent applicants maybe would choose some related or substituted patents as their references instead of NPE patents. In other words, NPE patents are not welcome for patent applicants because of some speculated notorious behaviors.

To sum up, there are two interesting findings disclosed in this paper.

- 1) The value of NPE patent display greater than ITC patent and litigated patents except the indicator of No. of Patent Citation Received.
- 2) The figure of No. of Patent Citation Received in NPE patents is the smallest one in the three group patents, litigate patents, ITC patents and NPE patents.

TABLE 6 COMPARISON OF LITIGATED PATENTS, ITC PATENTS, AND NPE PATENTS

Variables	Litigated patents	ITC patents	NPE patents
No. of Assignee	1.02	0.95	1.00
No. of Assignee Country	1.00	0.94	1.00
<b>No. of Inventor</b>	<b>2.06</b>	<b>2.68</b>	<b>2.75</b>
No. of Inventor Country	1.03	1.02	1.08
<b>No. of Patent Reference</b>	<b>23.23</b>	<b>32.67</b>	<b>54.54</b>
<b>No. of Patent Citation Received</b>	<b>28.77</b>	<b>32.41</b>	<b>10.67</b>
No. of IPC	4.68	4.43	2.53
No. of UPC	13.38	13.11	9.57
<b>No. of Claim</b>	<b>20.69</b>	<b>24.59</b>	<b>23.04</b>
<b>No. of Non-Patent Reference</b>	<b>6.83</b>	<b>9.7551</b>	<b>19.95</b>
<b>No. of Foreign Reference</b>	<b>3.18</b>	<b>5.2646</b>	<b>5.68</b>

TABLE 7 CHARACTERISTICS OF LITIGATED PATENTS AND NON-LITIGATED PATENTS OF NPES.

Variable	Litigated patent	Non-litigated patent	T-test	p-value
No. of Assignee	1.0000	1.0016	2.83	0.0047***
No. of Assignee Country	1.0000	1.0006	1.73	0.0833*
<b>No. of Inventor</b>	<b>3.1351</b>	<b>2.7377</b>	<b>2.67</b>	<b>0.0086***</b>
No. of Inventor Country	1.0631	1.0768	0.58	0.5618
<b>No. of Patent Reference</b>	<b>81.7477</b>	<b>53.9198</b>	<b>2.79</b>	<b>0.0053***</b>
<b>No. of Patent Citation Received</b>	<b>48.9009</b>	<b>9.8013</b>	<b>5.69</b>	<b>&lt;0.0001***</b>
No. of IPC	4.5495	2.4821	4.32	<0.0001***
No. of UPC	13.9640	9.4741	4.91	<0.0001***
<b>No. of Claim</b>	<b>29.7027</b>	<b>22.8908</b>	<b>3.22</b>	<b>0.0017***</b>
<b>No. of Non-Patent Reference</b>	<b>52.9730</b>	<b>19.1997</b>	<b>4.06</b>	<b>&lt;0.0001***</b>
<b>No. of Foreign Reference</b>	<b>10.8559</b>	<b>5.5667</b>	<b>2.96</b>	<b>0.0037***</b>

\*indicated p-value&lt;0.1, \*\*p-value&lt;0.05, \*\*\*p-value&lt;0.01

NPEs are active to take legal action because of their special business model. So how comes of NPEs take active legal action? From table 7, this study shows that NPE patents are valuable. In Table 7, this study is going to display more detail information of patent characteristics of NPEs' litigated patents and NPEs' non-litigated patent. This study also use two sample t-test to calculate the litigation patents and non-litigated patent of NPE patents in Table 7. The NPEs' litigated patents figure of No. of Patent Citation Received patent is 81.7477, and it is about 8 times larger than NPE patents in general. In addition, NPE litigated patents also display higher in the other 5 patent characteristics, No. of Inventor, No. of Patent Reference, No. of Claim, No. of Non-Patent Reference and No. of Foreign Reference, also display higher than NPE patents in general. So if a NPE use a patent which its patent characteristics are almost the same as the table 7 showed to take legal actions, the related firm must very be careful to face the hard Intellectual property war. In other words, table 7 displays what the litigated patents of NPEs looked like, and it also can alert some firms to prepare for the un-expected lawsuit of patent infringement.

#### IV. DISCUSSION AND LIMITATION

First, although the study tries its best to do the whole process in this paper, there are still some limitations to inform reader. First, there is no official list of NPEs, and neither its shell companies, e.g., [65] found there are at least one thousand and two hundred shell companies in IV Company by tracking their publication, presentation of CEOs and press in public media. In public, no one knows exact number of IV's shell companies, but the truth is that its shells still keep rising. Because some of NPEs strategy policy is to hind their patent information as possible as they could, it is hard to find out those shells companies of every NPEs. Two reasons why NPEs do their best to conceal their patent information; 1)one of their strategy is to hide their patents until the technology has become industry standards or the essential technology in industry. If so, the patent will be more valuable, and NPE can use this patent to request more licensing fees. 2)NPEs use shell companies to manage some notorious cases in court to maintain kind reputation,. Therefore, too many shell companies to collect by this study, only 4,947 utility patents

of 12 NPEs and related shells are found for analysis. According to paper [65], the NPE patents showed here are just a small proportion in NPE patents pool. Hence, this study hopes more NPE patents and its shells list are found, the analysis results will be more close to the reality.

Second, this study only choose USPTO as analyzing patent pool. What about the other official patent database, such as EPO, JPO and SIPO? Maybe the other researchers can use EPO first. Because America area and Europe area are the most popular area for NPEs from fig. 2. This study assumes that patent activities frequency is different from area to area because of a different area economic situation. However, another patent database, SIPO, can look forward to its development and detect NPEs activities. There is no denying that patent activities have positive relation with a country or an area's economic situation. Moreover, maybe NPEs' patent activities, business model and concepts would be totally different in these area because of culture factors. Different business model/concepts may led to different patent characteristic results. Also, in figure 1, this paper also remaining some interesting phenomenon: 1) why the litigated patents curve shapes like a mountain, and why there is a turning point appears in 2000 year? 2) Why a cross point appears between NPE patents curves and litigated patents curve in 2011? 3) Why the NPE patents curve and ITC patents curve cross in 2000 years? 4) Why the amounts of the litigated patents and ITC patents become unusual at 2000 years, but not NPE patents? Is there any prominent social changes, such as government regulations, global economic changes in 2000? And if so, why the NPEs can against the prominent social changes? How did these NPEs behave in 2000?

The issue of NPE is emerging in public, and it is so significant that America government has taken some procedures to fight mean NPEs [1]. No matter NPEs are benefit or devastating on patent system, the existence of NPEs is truth in patent market. In this study, the value of NPE patents are larger than litigated patents and ITC patents disclosed by using 5 main patent characteristics, No. of Inventor, No. of Patent Reference, No. of Claim, No. of Non-Patent Reference and No. of Foreign Reference, except No. of Patent Citation Received. In fact, this interesting finding arouses authors have more curiosities about the NPE

issue, e.g., 1) what kinds of value in this patent (more) in a patent? The legal protection? Economics? Is there any other indicators can clarify the type of evaluation in a patent? Or how many percentage of each three types of value compose in a patent? According to paper [4], litigated patents are more valuable. This study shows that NPE patents are more likely involved in infringement, so NPE patents are more valuable comparing to the ITC patents. However, the indicator, No. of Patent Citation Received, displays NPE patents are not so important in technology innovation, but more law protection and economic evaluation. If a way can conduct to analyze the composition of value, maybe it could be used for making policies to prevent some mean patent trolls. 2) If viewing NPE patents are "active patent", then it can view ITC patents are "passive patents", because of patents were investigated by ITC for violating 337 bill. So what's the main difference between ITC patents and NPE patents? The active patent (NPE patents) are totally different other patents NPEs play a more active role in patent market, and they are eager to find any possible ways to earn profit from patents. On the contrary, it can view that ITC patents play a passive role in patent market, because ITC investigates patent infringement once if a company's ITC suits that always involves the influence on the US industry, e.g., a judgment from ITC makes HTC lost its champion of market share at North-America in 2012. What is the difference between these two types of patents, NPE patents and ITC patents? Their features are totally different; one is active, and one is passive in using patent strategy from operating business concepts to actions in patent market. 3) How did NPEs choose patents as their patents? Is any indicators used in evaluation process by NPEs? If yes, these indicators are reliable indicators as representing the patent value.

Lastly, it is very interesting to keep digging out the issue of NPEs and related issues with NPEs. NPEs are special entities which located between sellers and buyers in patent market. Observing NPEs humanity behaviors always inspires new ideas in this paper.

## V. CONCLUSION

This study found 4,947 utility NPE patents issued by USPTO since 1976 to 2012, and there are totally 4,389,348 utility patents in this period. Totally 111 litigated patents found in 12 NPEs, Acacia, Intellectual Ventures, Inter Digital, Mosaid, Rambus, Rock star, Round Rock, Tessera, Walker Digital, WI-LAN, RPX, and Allies Security Trust.

Four concepts, Country, Industry, Corporates and Value, are used to observe NPEs activities. First, at the Country concept, United States has the largest NPE patents and NPE litigated patents. NPEs are more active in western countries at table 2. NPE patents increase dramatically in reality. In the industries concept, NPEs are more active in engineering industry, and many NPE patents are mainly involved in infringement in engineering and instruments industries. In addition, in order to learn more every NPEs patent portfolios

and patent strategies, table 4 shows the amounts of every NPE patents in five industries. Also, table 7 displays the situation of NPE patents involved in litigated patents and ITC patents in every NPEs.

So as to acknowledge patent value of NPEs, this study uses 11 patent characteristics to test and evaluate NPE patents. These six patent characteristics, No. of Inventor, No. of Patent Reference, No. of Patent Citation Received, No. of Claim, No. of Non-Patent Reference and No. of Foreign Reference have positive relation to detect patent value. In the NPEs' analyzed results, which matches [10] and [15] studies; the more valuable patents, the more significant patent characteristics of these six patent characteristics. One main interesting finding is that NPE patents are more valuable than litigated patents and ITC patents in No. of Inventor, No. of Patent Reference, No. of Claim, No. of Non-Patent Reference and No. of Foreign Reference except one patent characteristic, No. of Patent Citation Received. Besides, the figure in No. of Patent Citation Received of the NPE patents is the lowest one.

Lastly, here are some future research suggestions: 1) this study only view NPE patents in macro view, so who is the most valuable or successful NPEs in micro view? And how is the condition of the NPEs patent knowledge flow? Since NPEs is an emerging and important issue, how to be a successful NPE will be an interesting research. 2) If other researchers have more complete NPEs & Shells list, maybe it would find more amazing findings. This study didn't concern every NPEs & its list patent. 3) Different patent characteristics/indicators are suggested to add in the future studies. For instance, patent age, patent activities period, and the amount of a patent involved in infringement. Using more representative patent characteristics can depict patent value more close to depict what the really world it is.

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### APPENDIX

<b>NPES LIST AND ITS SHELL COMPANIES</b>	
<b>1.</b>	<b>NPE                      Acacia Shells</b> Acacia Global Acquisition Corporation, Acacia Media Technologies Corporation, Acacia Media Technology Group, Acacia Patent Acquisition Corporation, Acacia Technologies Services Corporation, Acacia Intellectual Property Fund, L.P. (the “Acacia IP Fund”), Acacia Research, Adaptix, Apollo Patent, Automated Facilities, Management Corporation, AV echnologies LLC, Brain Life, LLC, Broadcast Data, Retrieval Corporation, Broadcast Innovation LLC, Computer Acceleration Corporation, Computer Cache Coherency Corporation, Computer Docking Station Corporation, Contacts Synchronization Corporation, Creative Internet Advertising Corporation, Credit Card Fraud Control Corporation, Criminal Activity Surveillance, LLC, Database Structures Inc. , Data Encryption Corporation, Data Innovation LLC, Diagnostic Systems Corporation, Digital Security Systems Corporation, Disc Link Corporation, DN Lookups, DRAM Technologies LLC/ DRAM Memories Technologies, Email Link Corporation, Financial Systems Innovation LLC, Fluid Dynamics Corporation, Gametek, LLC, High Resolution Optics Corporation, Hospital Systems Corporation, Information Technology Innovation LLC, InternetAd LLC/ InternetAd Systems, IP Innovation LLC, KY Data Systems LLC, Location Based Services Corporation, Micromesh Technology Corporation, Microprocessor Enhancement Corporation, Mobile Traffic Systems Corporation, New Medium LLC/ New Medium Technologies, Parallel Processing Corporation, Parking Security Systems Corporation, Peer Communications Corporation, Priority Access Solutions Corporation, Product Activation Corporation, Refined Recommendations Corporation, Remote Video Camera Corporation Resource Scheduling Corporation, Safety Braking Corporation, Screentone Systems Corporation, Secure Access Corporation, Soundview Technologies LLC, Spreadsheet Automation Corporation, Technology Licensing Corp. , TechSearch LLC, Telematics Corporation, Unified Messaging Solutions, LLC, VData LLC
<b>2.</b>	<b>NPE                      Intellectual Ventures Shells</b> Ben Franklin, Northstar Acquisitions
<b>3.</b>	<b>NPE                      Inter Digital Shells</b> InterDigital Asia KK, InterDigital Canada Ltee, InterDigital Communications, InterDigital Finance Corporation, InterDigital Germany GmbH, InterDigital Mobilecom, Inc., InterDigital Patent Corporation, InterDigital Technology Corporation, InterDigital SE Asia, Ltd., InterDigital Telecom, Inc., InterDigital Facility Company, InterDigital IP Holdings, Inc., InterDigital Patent Holdings, Inc. InterDigital Wireless Holdings, Inc., Digital Cellular Corporation, IPR Licensing, Inc.* Formerly InterDigital Advanced Technologies, Inc. and Tantivy Communications, Inc.), Universal Service Telephone Corp., USTC Supply Corporation, USTC World Trade Corporation, Wireless Digital Networks, Inc., VID SCALE, Inc.
<b>4.</b>	<b>NPE                      Mosaid Shells</b> Mosaid Technologies, Mosaid Corporation, Core Wireless Licensing
<b>5.</b>	<b>NPE                      Rambus Shells</b> Rambus Delaware LLC, Rambus Deutschland GmbH (Germany), Rambus International Ltd., Rambus K.K. (Japan), Rambus (Grand Cayman Islands, BWI) Rambus Chip Technologies (India) Private Limited, Rambus Korea, Inc. (Korea) Cryptography Research.
<b>6.</b>	<b>NPE                      Rock star Shells</b> Rockstar Bidco, Rockstar Consortium
<b>7.</b>	<b>NPE                      Round Rock Shells</b> Round Rock Research LLC.
<b>8.</b>	<b>NPE                      Tessera Shells</b> Tessera Technologies, Inc., Tessera Intellectual Property Corp., Tessera, Inc., Tessera Research LLC., Digital Optics Corp., Invensas Corp.
<b>9.</b>	<b>NPE                      Walker Digital Shells</b> Walker Digital, LLC, Walker Digital Management, LLC, Walker Digital Gaming, LLC, Walker Digital Table Systems, LLC, Walker Digital Lottery, LLC, Walker Digital Vending, LLC
<b>10.</b>	<b>NPE                      WI-LAN Shells</b> Wi-LAN Capital Inc., Wi-LAN International Inc., Wi-LAN International Hong Kong Inc., Wi-LAN International Japan Inc., Wi-LAN International Taiwan Inc., Wi-LAN USA, Inc., Gladios IP Inc.
<b>11.</b>	<b>NPE                      RPX Shells</b> RPX Corporation, RPX-NW Acquisition LLC. , RPX-LV Acquisition LLC.
<b>12.</b>	<b>NPE                      Allied Security Trust Shells</b> Abraham Lane, LLC, Bent Light Technology, LLC, Black Maple, LLC, Blue Ladder, LLC, Blue Legend, LLC, Bollinger Lane, LLC, Bridge Crossing, LLC. Crescent Moon, LLC, Full Spectrum Technologies, LLC, Hawthorne Heights, LLC. Haystack Alley, LLC, Honeygo, LLC, Jefferson Valley, LLC, Jenny Hill, LLC Lady Kensington, LLC, Liberty Lane, LLC, Meerkat Technology LLC. Overland Enterprises LLC, Peripheral Vision, LLC, Pleasant View, LLC. Red Acre, LLC, Red Fern Valley, LLC, Ringsoft, LLC, River Road Technologies, LLC, River Works, LLC, Rooster Row, LLC, Sage Technology, LLC. Seven Circle, LLC, Shiftlink, LLC, Silent River, LLC, Stature Ventures, LLC. Trey Run, LLC, Tudor Empire, LLC, TurnBridge Wells, LLC, Tuttle Lane, LLC. Twister Investments, LLC