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Quantified the Georgia-Pacific Factors for Calculating Reasonable Royalties

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ABSTRACT

Reasonable royalties have been adopted as a way to calculate damages for patent infringement in many litigation cases of judicial court. In determining reasonable royalties, the fifteen factors listed in *Georgia-Pacific Corporation v United States Plywood Corp.* (1971) are often cited by the Federal District Courts and the Court of Appeals for the Federal Circuit (CAFC) of United States. Many of these factors are inter-related. This paper explores the inter-relationships among them and how these factors moderate the initial royalties by analyzing judgments that have referenced and analysed the Georgia-Pacific factors from the US Federal District Courts and CAFC since 1995. The paper aims to provide a simple yet grounded guideline for licensees and licensors to handle their respective risks in patent litigations.

We identified the effects of each factor on the reasonable royalties to be determined. In addition, we have further analysed the relatedness between the factors so that they can be categorised. This analysis provides a systematic guideline for royalties' negotiations. With the statistical analysis of those cases that have discussed the Georgia-Pacific factor, we manage to quantify the relative effects of each factor on the final reasonable royalties determined. For example, we found out that the eleventh factor "the extent to which the infringer used the invention and any evidence probative of the value of that use" is the most determining factor to increase the reasonable royalties. On the other hand, the third factor "the nature and scope of the license, such as whether it is exclusive or nonexclusive, restricted or non-restricted in terms of territory or customers"

acts to decrease the value of the reasonable royalties in most cases. From this, we propose an equation for calculating the final reasonable royalties from an initial starting value. This equation can provide a simple guideline for patent licensees and licensors to base their royalty rates in licensing agreements.

Keywords: reasonable royalties, Georgia-Pacific factors, licensing, contracts

1. Introduction

In patent infringement disputes, once patent validity and infringement have been confirmed, the final step would be to determine damages to be paid by patent infringer. Under 35 U.S.C. § 284, "upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court." Damages can be paid in the form of lost profits. In the event when lost profits are inadequate to compensate patent holders, reasonable royalties can be awarded in addition to lost profits or replacing compensation by lost profits altogether. Between 1980 and 2000, 83% of the patent infringement cases used lost profits as the basis to award damages to patent holders. Since 2000, 77.9% of the patent infringement cases have used reasonable royalties to calculate awarded damages.

The CAFC uses two methods to calculate reasonable royalties: analytical approach and hypothetical negotiation approach. Analytical approach involves calculating damages based on internal profit projections of patent infringer for the infringing item at the time the infringement began. It then apportions the projected profit between the parties as a percentage of sales to determine the reasonable royalty damages. In the hypothetical negotiation approach, reasonable royalty is defined as the amount which would have been set in a hypothetical negotiation between a willing licensor and a willing licensee in the infringer's position, when the infringement began and both parties assumed the patent was valid and enforceable. As the analytical approach relies on getting the internal documents from patent infringer and they are usually difficult to obtain, therefore, the hypothetical negotiation approach is used more often in courts. Thus, this approach would be the focus of this paper and they are further analysed in the next session.

2. Literature review

In the hypothetical approach, the seminal case is Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116 (S.D.N.Y. 1970), mod. and aff'd, 446 F.2d 295 (2d

Cir. 1971), cert. denied, 404 U.S. 870 (1971). In this case, the court has put forward 15 factors for the determination of reasonable royalties. As these 15 factors are the core of this research, we have reproduced them in the table below and codified them for convenient reference throughout the paper.

Code	Code Name	Code explanation(1970)
GF1	Established royalty	The royalties received by Georgia-Pacific for licensing the patent, proving or tending to prove an established royalty.
GF2	Rates for similar products	The rates paid by the licensee for the use of other similar patents.
GF3	Nature and scope of license	The nature and scope of the license, such as whether it is exclusive or nonexclusive, restricted or non-restricted in terms of territory or customers.
GF4	Patent monopoly power of licensor	Georgia-Pacific's policy of maintaining its patent monopoly by licensing the use of the invention only under special conditions designed to preserve the monopoly.
GF5	Commercial relationship between licensor and licensee	The commercial relationship between Georgia-Pacific and licensees, such as whether they are competitors in the same territory in the same line of business or whether they are inventor and promoter.
GF6	Sales generation power of patent	The effect of selling the patented specialty in promoting sales of other Georgia-Pacific products; the existing value of the invention to Georgia-Pacific as a generator of sales of non-patented items; and the extent of such derivative or “convoyed” sales.
GF7	Licensing terms	The duration of the patent and the term of the license.
GF8	Commercial success of patented product	The established profitability of the patented product, its commercial success and its current popularity.
GF9	Utility and advantage	The utility and advantages of the patent property

	of patent property	over any old modes or devices that had been used.
GF10	Nature and character of patent invention	The nature of the patented invention, its character in the commercial embodiment owned and produced by the licensor, and the benefits to those who used it.
GF11	Benefits of patent to infringer	The extent to which the infringer used the invention and any evidence probative of the value of that use.
GF12	Industrial norms for products' profits	The portion of the profit or selling price that is customary in the particular business or in comparable businesses.
GF13	Profits attributed to the patent	The portion of the realizable profit that should be credited to the invention as distinguished from any non-patented elements, manufacturing process, business risks or significant features or improvements added by the infringer.
GF14	Expert opinions	The opinion testimony of qualified experts.
GF15	Hypothetical agreed royalty	The amount that Georgia-Pacific and a licensee would have agreed upon at the time the infringement began if they had reasonably and voluntarily tried to reach an agreement.

Table 1 Codified Georgia-Pacific Factors

These 15 factors have been used as the "golden standard" in determination of reasonable royalties to be awarded as damages. However, simply handing these 15 factors to the jury as guidelines in determining damages has not proved to be sufficient. The factors are vague in nature. This leaves the jury a lot of discretion to interpret these factors (Lemley 2011). Press has constantly reported exuberantly large amount of damages awarded to patentees (McGrath and Kedrowski 2007; Robertson 2011). This leads to arguments that the current damage rules have resulted in systematic overcompensation for patentees (Elhauge 2008). Since the fifteen factors are complex, this makes review and scrutiny by judges difficult (Durie and Lemley 2010; Seaman 2010).

Scholars have made various suggestions to maximise the merits of this set of factors.

Durie and Lemley (2010) have suggested a structured approach to calculate reasonable royalties based on the 15 factors cited in Georgia-Pacific case. They suggested that most of the 15 factors essentially answered three questions: "(1) what is the marginal contribution of the patented invention over the prior art?; (2) how many other inputs were necessary to achieve that contribution, and what is their relative value?; and (3) is there some concrete evidence suggesting that the market has chosen a number different than the calculus that results from (1) and (2)?". They argued that factor 14 on the expert opinions and factor 15 on a hypothetically negotiated reasonable royalties were not factors to be weighed. Expert opinions were sources of evidence and hypothetical negotiated royalty was the very question that all the rest of the fifteen factors were trying to answer. They then proposed that the remaining 13 factors to be organised and structured into four main categories: (1) nature of the patentee; (2) incremental contribution of patented technology; (3) other inputs to the patented invention; (4) relevance of actual negotiations. This approach facilitates judicial review of jury verdicts and can provide evidence about what patent contributes to the disputed products. However this is just a structured framework for determining reasonable royalty, it still has not addressed the issue of vagueness of these factors. This paper proposes a framework with weighted set of Georgia-Pacific factors based on a similar concept of restructuring the 15 factors.

McMullen and Halprin (1993) attempted to quantify the factors by expressing the royalty to be awarded as a percentage of net margin (operating income before tax (revenues - COGS - selling, general, and administrative expenses). Weighing each factor equally, they then grouped the Georgia-Pacific factors into 10 categories of relevance to market and competition in the industries. They found that court had the tendency to award higher royalty (77%-150%) for cases with more than 7 factors present. The court awarded lower royalty (27%-43%) for cases with 6 or less factors. They did not mention about the criteria to select the cases and the number of cases involved was small.

In Standard Manufacturing Co[1], the court has proposed a way to quantify the Georgia-Pacific 15 factors. They suggested that each factor that had a positive effect on the royalty rate would be awarded a value of positive 1. If the effect was strong, it would be awarded a value of positive 2. On the other hand, if the factor had a negative

[1] Standard Mfg. Co. v. United States, 42 Fed.Cl. 748 (1999)

effect on the royalty rate, it would be awarded a negative 1. If the effect was strong, it would be awarded a value of negative 2. Using this method, the 15 factors would be quantified. In that case, the final royalty rate resulted from this method caused an initial royalty of 4.3% to increase to 16.3%. This way of quantifying the various conditions has not been widely adopted or referenced. However, the court has mentioned a sequence in applying the Georgia-Pacific and this is represented in Figure 1. Many experts in citing the Georgia-Pacific factors have adopted this sequence.

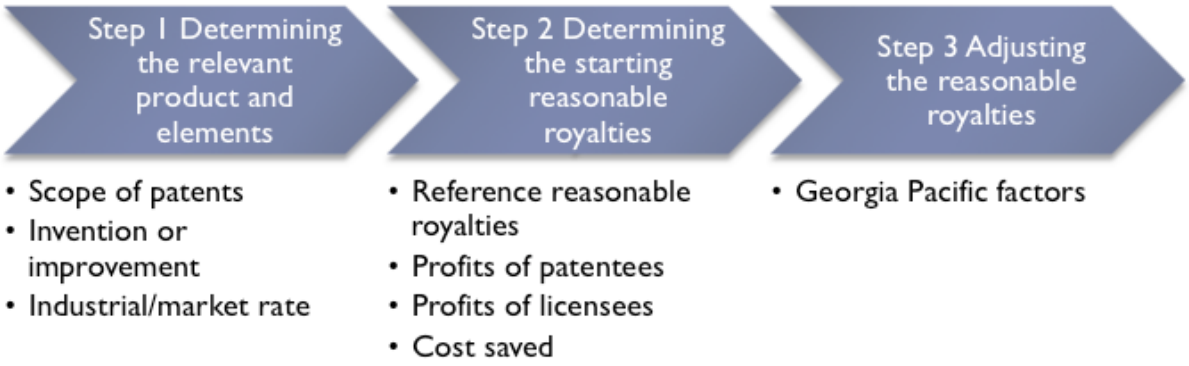

Figure 1 Sequence in applying the 15 factors listed in the case of Georgia-Pacific v Plywood

Other than the simplistic ways of quantifying the Georgia-Pacific factors, there are other attempts to quantify these factors using existing economic models in order to give a convenient tool for judges and jury to determine reasonable royalties. One common model is the game theory model. Choi and Weinstein (2001) were one of the earliest to use the model to interpret the factors enunciated in the Georgia-Pacific case and apply them in a hypothetical negotiation. As stated by the court in the Georgia-Pacific case, reasonable royalty is defined as,

> 'the amount that a licensor and a licensee would have agreed upon (at the time the infringement began) if both had been reasonably and voluntarily trying to reach an agreement; that is, the amount which a prudent licensee-who desired, as a business proposition, to obtain a license to manufacture and sell a particular article embodying the patented invention-would have been willing to pay as a royalty and yet be able to make a reasonable profit and which amount would have been acceptable by a prudent patentee who was willing to grant a license.'[2]

[2] *Georgia-Pacific,* 318 F. Supp. at 1120.

Therefore, this resembles a bargaining situation under the game theory. In this game theory model, the Nash Bargaining Solution (NBS) is used to describe the various scenarios of one supplier, two supplies or when there are non-infringing substitutes available. By using the NBS, the factors are in effect weighted. Similarly but taking it further, Zimmeck (2012) used game theory to quantify the 15 factors in the Georgia-Pacific case. He correlated each factor in the Georgia-Pacific case to a parameter in the NBS. He mentioned that if the first factor, which is existing similar licensing royalties, exist, it would be very determinative and heavily dependent on. Otherwise, a Nash Bargaining Model with unequal bargaining power could be used. He expressed the payoff for each player and identified that by determining the total expected payoff, respective disagreement payoff and the respective bargaining power, the reasonable royalty could be determined. He then correlated the Georgia-Pacific factors that could help to determine these values.

Other than relating the Georgia-Pacific factors with classical economic models, Epstein and Marcus (2003) incorporated the corporate finance model into quantifying the Georgia-Pacific factors. They took the infringing activity as an investment and aimed at earning the largest profits from there. The maximum value to be paid for the royalty rate would be determined by the profitability of the alternative replacement project for the infringing activity. If there was no alternative, the royalty would be determined by the minimum return to make the investment attractive to investors. This is called the cost of capital. They then defined an internal rate of return (IRR) defined by the project's own internal cash flow. This IRR is used to compare with the cost of capital. There should be royalty paid only if IRR is greater than the cost of capital. The model determines the royalty as 'a function of four parameters of the infringing project: the cost of capital, the IRR spread, useful economic life, and the ratio of the NPV of the alternative to the NPV of the infringing project (which measures the ability of the alternative to "replace" the infringing profits)'.

This idea of calculating the royalty rate based on best alternatives or substitutes is also advocated by other scholars, though they did not propose similar mathematical models. Seaman (2010), for example, said that in a hypothetical negotiation, any rational prospective licensee would consider the 'Best Alternative to a Negotiated Agreement' (BATNA), which was a negotiation strategy detailed in the book written by Fisher and Ury (2011). Based on this, Seaman proposed that the licensing fee for the patented

technology should be less than the sum of costs to acquire or obtain the non-infringing substitute, "switching" costs related to adopting the non-infringing substitute and incremental benefits of adopting the patented invention.

In a way, these economic models have provided comprehensive ways for determining the reasonable royalty inclusive of starting values and the factors to be considered in the process of negotiation. This contrasts the other camp that intended to use the Georgia-Pacific factors as sliding factors to adjust the initial royalty rate that each party has in mind. The economic models are useful frameworks for the court to determine reasonable royalties to be awarded in patent infringement cases. Expert witnesses may base their opinions using these models. However, for daily business use, the economic models may be too complicated to be practical. This is especially the case for SMEs and startups who do not have the money to employ experts to calculate for them. Therefore, in negotiating licensing deals, the more practical approach for companies would be having a reasonable initial value and then consider through the suggested factors for tuning and negotiation. This part of the thesis will provide a framework for these negotiations and the Georgia Pacific factors would be the elements in the framework. In particular, I will look into whether there are heavier weightages for some factors. Shapiro (2011) mentioned that after the Uniloc v Microsoft[3] (2011) case, court would pay more attention to the technology itself. I would explore whether there are other factors that should also be of importance.

3. Data

Using LexisNexus, we have identified cases where judges have referenced the Georgia-Pacific case since 1995. There are 96 cases cited this case (Appendix 1). After some manual sorting, we have identified those cases where these factors have been discussed (35 cases out of 96, i.e. 36%) and included them in our study. This set of cases was used to determine the inter-relationship between the various factors and categorise them to have a structured approach to use the Georgia-Pacific 15 factors. In the second part of this research, we need to further filter the case to sort out those cases that can be used for investigating the relationship between the various categories. The criteria to select those cases are the mention of the initial and final royalty, the

[3] Uniloc USA, Inc. v. Microsoft Corp., 632 F.3d 1292

calculation basis and the use of the Georgia-Pacific 15 factors to determine the final royalty. Only 15 cases out of these 35 cases fulfil these criteria. In addition, we chose 4 out of these 15 cases based on completeness of financial information to fit to the Nash bargaining solutions to give a quantified analysis based on the Georgia Pacific factors.

4. Method

In determining reasonable royalty, the court will first determine the royalty base, starting royalty and then use the Georgia-Pacific factors to adjust the final reasonable royalty. The steps are as shown in Figure 2. In the first step, the court would check through the claims in the patent to determine whether the royalty base should be based on the entire product or just an element in the product. In the second step, the court will determine the starting royalty by considering similar established licenses, the benefits of the patent to the patentee and licensee respectively. In the third step, the court would then consider the Georgia-Pacific 15 factors to adjust the starting royalty to the final reasonable royalties.

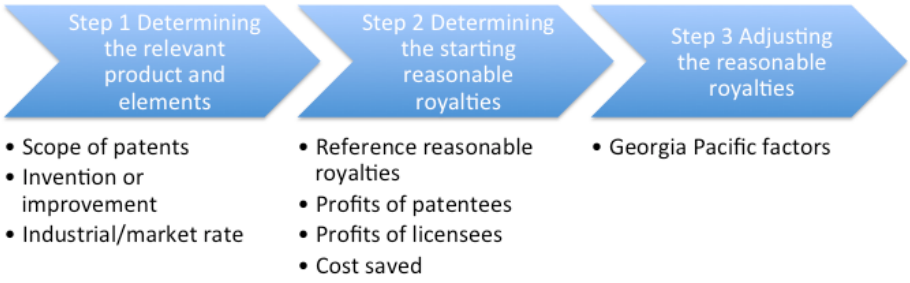

Figure 2 Steps to apply the Georgia-Pacific case

5. Results

5.1 Basic trends of the influence of each Georgia Pacific factor on the final reasonable royalty

We analysed the cases and determined whether each factor has a positive, negative or neutral effect on the final reasonable royalties. The results are shown in Figure 4 below. The neutral curve suggests how influential the factor is. The smaller the number of neutral cases decided, the more would be the sum of positive and negative cases determined. Factor 3, 4, 5, 8, 9, 10, 11, 13 are those with the lower values of neutrality. This shows that they are the factors that will affect the reasonable royalty the most. These factors fall under the licensing environment and patent value categories.

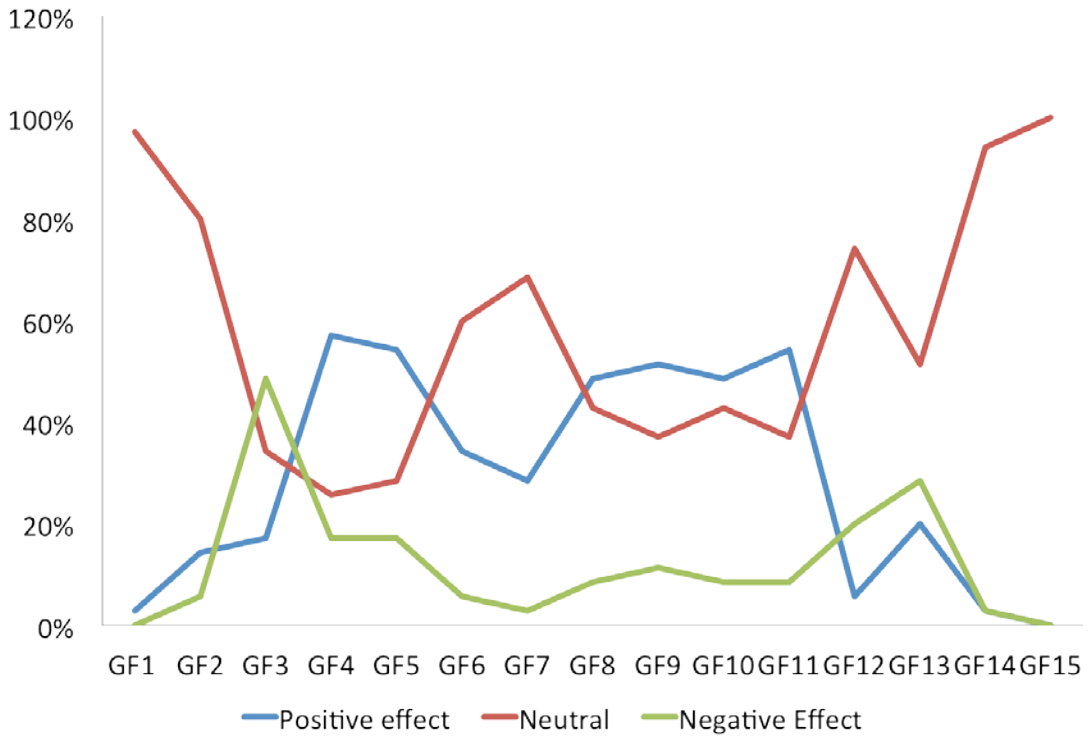

Figure 3 Statistical analysis of the effects of each Georgia-Pacific factors as determined by courts

In order to further look into the degree of influence of each factor, the following graph has been plotted. In our statistical analysis, the following annotations have been made to its effects to reasonable royalty rate:

Strong positive influence, quantified as +2

Positive influence, quantified as +1

Neutral influence, quantified as 0

Negative influence, quantified as -1

Strong negative influence, quantified as -2

The results are shown. For example, it can be seen that GF3 “nature and scope of licence” has been considered widely to decrease the reasonable royalties if the nature and scope of licence are wide. On the other hand, GF11 “Benefits of patents to infringer” has seen to increase the reasonable royalties in many cases.

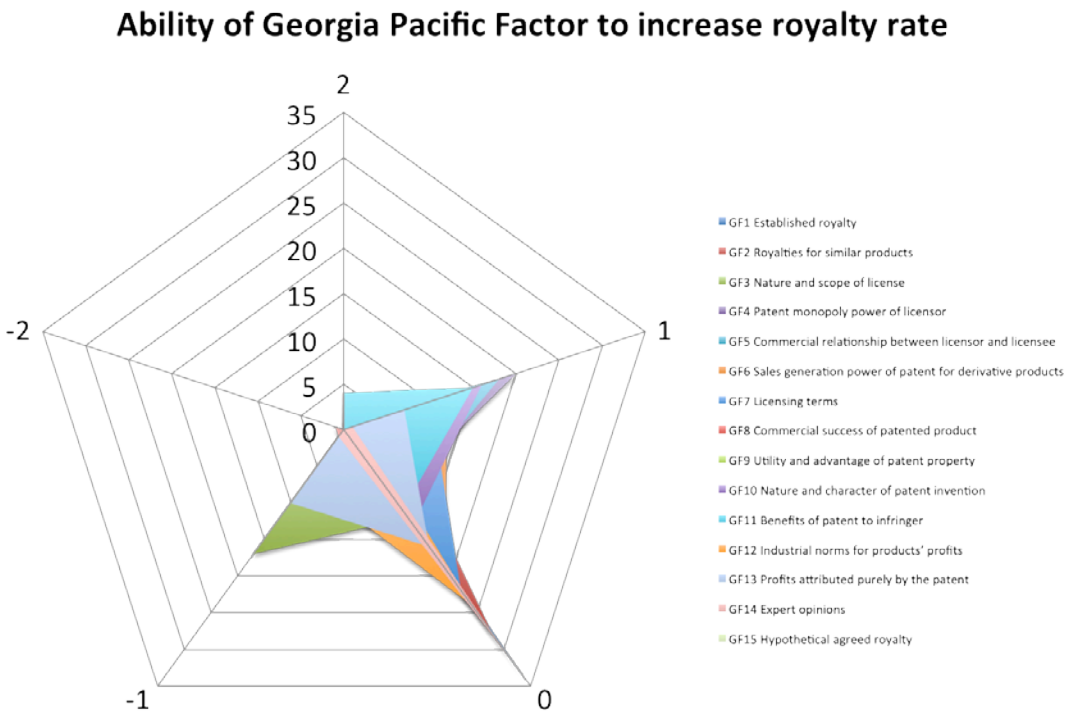

Figure 4 Further analysis on the degree of influence of each Georgia Pacific factor

5.2 Quantifying the Georgia-Pacific 15 factors using the Nash bargaining solution

In our research, we will follow through these steps but quantify the data based on the Nash equilibrium solutions for hypothetical negotiations. Using the Nash bargaining model with unequal bargaining power Zimmeck (2012),

$$\pi_1=d_1+\alpha(\Pi-d_1-d_2)$$

the payoff for player 1, the licensor is given by:

the payoff for player 2, the licensee is given by:

$$\pi_2=d_2+(1-\alpha)(\Pi-d_1-d_2)$$

$$\pi_2 = (m - \mho)Xt$$

π_1, π_2 : payoffs for player 1 and 2 respectively

$\prod$: total expected payoff

d_1:patent holder's disagreement payoff

d_2:licensee's disagreement payoff

α: bargaining power

m: margins

v: profits attributed to patents

X: number of units sold

t: duration of hypothetical license

Therefore, reasonable royalty, s can be calculated as:

$$\pi_1 = d_1 + \alpha\left(\frac{\pi_2 - d_2}{1-\alpha}\right)$$

The corresponding Georgia-Pacific factors that are involved to calculate these terms are shown in Figure 5.

Code	Code Name	Total expected payoff (millions)	Anticipated profits	Derivative and conveyed sales	patent values	number of units sold (millions)	Duration of hypothetical license (years)	Disagreement payoffs (monopoly)	Disagreement payoffs, BATNA	Bargaining power of licensor	Reasonable royalty
GF1	Established royalty	☆	☆								
GF2	Rates for similar products								☆		
GF3	Nature and scope of license	☆	☆								
GF4	Patent monopoly power of licensor							☆			
GF5	Commercial relationship between licensor and licensee									☆	
GF6	Sales generation power of patent	☆		☆							
GF7	Licensing terms	☆					☆				
GF8	Commercial success of patented product	☆	☆								
GF9	Utility and advantage of patent property	☆			☆						
GF10	Nature and character of patent invention	☆			☆						
GF11	Benefits of patent to infringer	☆			☆						
GF12	Industrial norms for products' profits	☆									
GF13	Profits attributed to the patent	☆			☆						
GF14	Expert opinions	☆									
GF15	Hypothetical agreed royalty										

Figure 5 Correspondence between Georgia-Pacific factors and Nash Bargaining solutions

With sufficient financial information provided, the corresponding reasonable royalty rates can be calculated. For example, in the case Procter & Gamble Co. v. Paragon Trade Brands (1997) (989 F.Supp. 547), the starting reasonable royalty was 1.35%. After considering all the Georgia-Pacific factors, the court decided a royalty of 2%. With the Nash bargaining solution described above, the calculated reasonable royalty was 2.2%. In another case Revolution Eyewear v. Aspex Eyewear (2008) 2008 WL 6873809 (C.D.Cal.), the starting reasonable royalty was 5%. After considering all the Georgia-Pacific factors, the court decided a royalty of 5%. With the Nash bargaining solution described above, the calculated reasonable royalty was 5.2%.

6. Conclusion

This paper has given insights to the trends that each factor has been used to affect the

final determined reasonable royalties. With this understanding, negotiating parties can increase the pie of negotiation by using those factors as bargaining chips. For example, Georgia-Pacific factor 3 that describes the nature and scope of the license was seen often to have negative effects on the overall reasonable royalty. Georgia Pacific factor 11 that describes the benefits of patents to the licensee, on the other hand, was seen as to have positive effects on the overall reasonable royalty.

In addition, it has also been demonstrated the Georgia-Pacific factors can be quantified using the Nash bargaining solution. This can serve as a guideline for expert witnesses to base their reasonable royalty calculations on. In addition, the solution can also be used in practical licensing negotiations to guide practitioners.

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