PATENT VALUATION ON ORGANIC COMPOSITE BOARD FOR VERTICAL GARDEN IN CIBINONG SCIENCE AND TECHNOLOGY PARK (CSTP)

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Abstract

The commercialization of patents is crucial for Cibinong Science and Technology Park (CSTP) sustainability. However, commercialization requires proper valuation and business analysis. Moreover, the existing valuation methods need to be adjusted to fit for the CSTP condition. The patent of the organic composite vertical garden is being used as an example for composing the fit valuation method; this patent is considered to be easy to value, due to its simple production process and technology. The valuation of this patent was explored by using mixed methods by combining Porter's five force and Pestle analysis to explore business nature and external business environment of the invention, comprehend with Discounted Cash Flow (DCF) to calculate its license fee and royalty fee. Overall, the vertical garden market is still wide open for this invention, although some technological aspects of the invention need to be improved. Porter's five force and Pestle analysis show that majority factor and issues related to this invention is conducive so that the royalty fee can be set at a high value. The DCF showed that the business value (NPV) reached about IDR 1.3 billion and the license fee was about IDR 114 million. This result was acceptable for the inventor and potential licensee. In addition, this study recommends that the mixed method valuation is more comprehensive than using cost-based or market-based method and it fits for CSTP.

Keywords: patent, valuation, commercialization

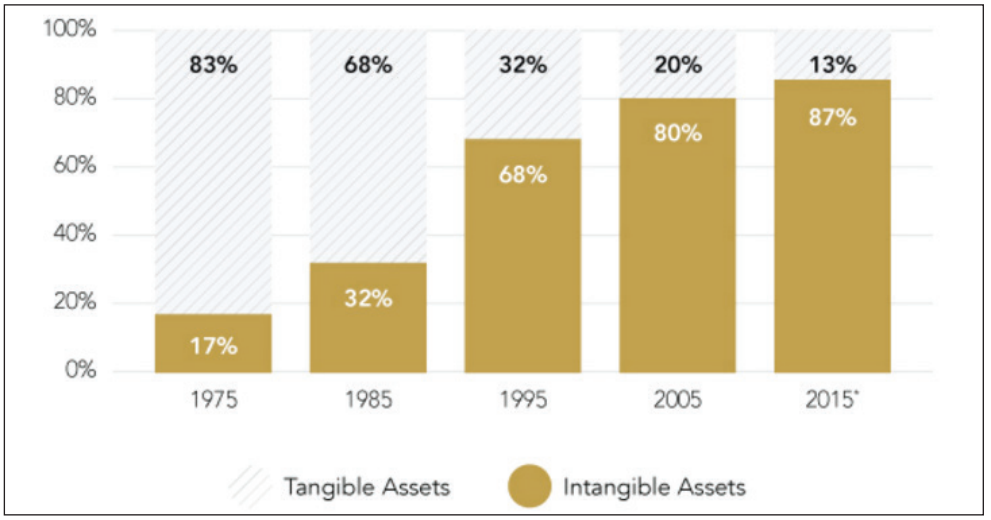
JEL Classification: M21, O34

INTRODUCTION

Cibinong Science and Technology Park (CSTP) was officially established in 2015 under LIPI's management. The establishment was inline with Indonesian government's program, of 100 STP/TP/SP as stated in Indonesia's middle term development plan [*Rencana Pembangunan Jangka Menengah*/RPJMN] (Bappenas, 2015). One of CSTP business core is commercializing LIPI's intangible assets, such as knowledge, expertise, and intellectual properties including patents.

Nowadays, patent valuation is important for business entities, patent is considered as valuable intangible asset. The global trend shows that more companies have higher value on their intangible assets (non-physical, e.g. intellectual properties, stocks, expertise, business models) compared to tangible assets (physical, e.g. infrastructures, vehicles, and machineries). Ocean Tomo's 2015 report showed that the intangible assets of S&P 500 companies increased significantly to 87% within decades, and make the value of tangible asset smaller (Figure 1) (Stathis, 2015). This happened because their brands, inventions and innovations continue to grow exponentially within years and benefiting the companies, more than their tangible assets. Following this, the trend should bring huge benefits to government institute such as LIPI that has enormous intellectual property right assets. However, valuable assets are the ones that can be commercialized. That is why CSTP have to be more concerned on managing and commercializing the intangible assets to get more revenues, so it can be an independent institutions and not depends on government's funding.

In terms of patent commercialization, CSTP was still in poor performance, it only commercialized one patent in 2015 and three patents in 2016, from total 433 LIPI's registered patents. Overall, only about 1% of total patents that have been commercialized. One of the main problems is that CSTP were unable to produce a proper valuation of the patents. The patent cannot be promoted effectively without knowing how much it worth. Patent's value will vary, depends on the valuation reason, the use of a specific valuation approach or a combination



Source: Ocean Tomo (2015)

Figure 1. Components of S&P 500 Market Value

of approaches, and on what kind of value is required (ip4inno, 2007).

This study uses patent of organic composite board for vertical garden to be an ideal example to implement the modified valuation method. This patent has been selected for commercialization project in CSTP because it just recently registered (2016) and already has inquiry for its license. This technology is actually quite simple, the board was made from a composition of coconut fiber and Phenol Formaldehyde resin (PF) adhesive (23%) then processed with hot press machine. The board then layered with geotextile and covered with zincalum plate. There are three differences with existing products such as geotextile pocket vertical garden, which (i) it can be mass produced; (ii) it is organic and it is easy to plant; and (iii) the price is relatively cheap (Gopar, 2015).

LITERATURE REVIEW

There are three approaches for patent valuation that have been used globally, which are cost-based, market-based, and income-based approach (Garland, 1998). Cost-based method is a valuation method where the calculation is based on the amount of expenses incurred to create an intangible asset. There are two ways in the cost-based method: using historical cost and replacement cost. Historical cost measures actual costs incurred to create IP. This method has the disadvantage that there is no correlation between the total expenditure cost of assets and the value of the asset. Replacement cost provides the value of the asset by considering the cost of replacing this asset and other costs such as the cost of brand building. The asset value of the calculation using this method may be close to the value of the asset commercially, but how to estimate these future costs appropriately?

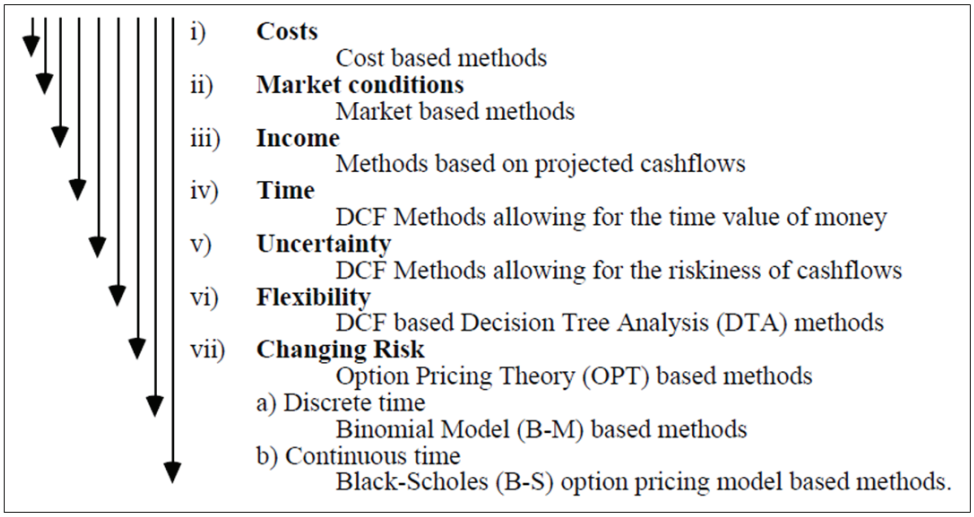
According to Garland (1998), the market-based method is divided into two parts: Market Price Comparability and Comparable Royalty Rate. The Market Price Comparison method determines the IP value by comparing the price of similar IP transactions on the market. Actually, this method is the most objective method. However, it is difficult to find transactions for similar IP products in the market. Information related to such transactions is very small and usually not open to the public. The Comparable Royalty Rate method specifies an IP value based on the license value that occurs. This method provides a more feasible way to identify an IP value.

The last one is an economic based method. This method determines the value of IP by plotting a business plan from an IP that has the potential to generate profits. The values are assumed and estimated by considering the value in the next few years. In this method, there are two main components, which are identification, separation, and quantification of the cash flows or royalty fees attributable to the IP; and the capitalization of the future cash flow (Garland, 1998).

Robert Pitkethly (1997) said in his paper that Russell and Parr share

the method of valuation of IPs in several types: Cost, Market and Income based methods, while Arthur Andersen shares methods for IP valuation consisting of Cost, Market Value and Economic Value methods. Pitkethly classifies it in Figure 2. The categorization in Figure 2 illustrates the sophistication of IP methods.

Since 2015, CSTP has determined value of patents using cost-based approach as mentioned in LIPI's policy (LIPI, 2015), while this method is only fit for intangible asset valuation as in annual report but not suitable for determining a proper license and royalty fee accepted by business entity (Aiman, 2014; Kratiger, 2007). Therefore, different patent valuation approach is needed, which is the income-based approach that can accurately calculate and predict future cash flow (Pinto, Henry, Robinson & Stowe, 2010). However, there are some parts in the existing income-based approach valuation that are not suitable for CSTP. The existing valuation only calculate the amount of royalty fee but it cannot count the license fee. This CSTP valuation needs to determine how much are the license fee and royalty fee. License fee is the first payment that should be paid by the licensee after signing the license contract, while royalty fee is an annual payment as a benefit share to the patent owner. In addition, a reliable valuation must be supported with business analysis to build a detail and strong foundation.



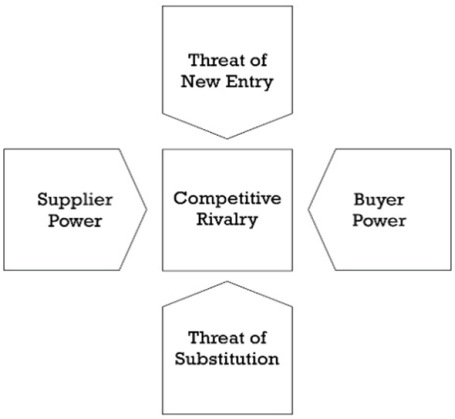
Source: Pitkethly (1997)

Figure 2. Classification of IP Valuation Method

RESEARCH METHODS

This study is an exploratory research in finding the fit valuation for CSTP patents, using a case of organic composite vertical garden patent valuation. The research used mixed methods, combining qualitative and quantitative

analysis to get a comprehensive result (Creswell, 2003). Porter's Five Forces and PESTLE (Political, Economic, Social, Technological, Legal, Environmental factors) qualitative analysis is being used to understand the business environment of the patent. Data for this analysis were collected from internet and other references. Porter's Five Forces is a simple model that suitable to understand business nature and barrier to entry the market for new developed products/ inventions (Porter, 1985). There are five aspects that have been analyzed in this model, which are: (1) supplier power, (2) buyer power, (3) threat of substitution, (4) threat of new entry, and (5) competitive rivalry (Figure 3). This model has been used for early analysis in commercializing invention at several institutions, such as Isis Innovation at Oxford University, United Kingdom and also at The University of Queensland, Australia. This analysis can be done in a short time and requires less effort in collecting data but the result is reliable for preliminary business analysis.



Source: Porter (1985)

Figure 3. Porter's Five Forces Model

PESTLE analysis is commonly used for launching new service or product in certain area or country, which consider six factors : (1) Political factor, (2) Economic factor, (3) Social factor, (4) Technological factor, (5) Legal factor, and (6) Environmental factor (Kiesha Frue, 2017). PESTLE analysis provides a framework to investigate the external environment for an organization/service/product. Potential issues in each factor need to be documented. Then, each factor is evaluated in order to identify the most likely factor affecting the organization. The result of PESTLE analysis is a list of key external influences that could cause it to take action, either to gain from an opportunity that appears or to ensure that any threats are removed (Cadle, Paul & Turner, 2010). The qualitative analysis is being used as a platform to determine royalty fee rate and support the Discounted Cash Flow (DCF) calculation. Royalty fee range is within 1-5% from sales (Aries & Newton, 1955). Although there are no exact rules to determine this, the range is highly acceptable by many industries.

DCF is a mathematic calculation to show the worth of product/patent, what can be generated in cash over its life. The DCF method, sometimes referred to as the Net Present Value (NPV) method or the Income method (Razgaitis, 2009). This method can determine today's perceived value of the future net cash inflows enabled by the licensed technology by quantifying the business size, time frame, and risk of all such future cash benefits and costs.

In this study, NPV is considered as the main result of the DCF. The NPV formula can be written as follows:

$$NPV = \sum (B - C / (1 + i) \quad (1)$$

Where:

B= Benefit/Revenue

C= Cost

i = interest

The NPV is used to calculate a license fee of Patent. Patent has potential economic value within its protection time (future value). The future values of the Patent need to be assessed to acquire present value, which require Net Present Value calculation. This assessment holistically calculated the potential values of the Patent within its life time, considering interest rate and business cash flows. This calculation were combined with the rule of thumb or known as 25 percent rule. The 25 percent rule is commonly used to determine the royalty fees (Goldscheider, 2011). A rule of thumb suggests that a licensee pays a royalty rate equivalent to 25.0% to 33.0% of its Earning Before Interest and Tax (EBIT) margin for the product that incorporates the intellectual property (Gopalakrishnan, 2015). However, on 4 January 2011, the US Federal Circuit put an end to this rule (Olson & Verkuil, 2011). The court and many industries believe that this rule make the royalty fee higher than supposed to be for many dispute cases. In Indonesia, the result of 25 percent rule for royalty fee is also considered to be too high and unacceptable for negotiation. Therefore, in this study, the rule is being used to calculate the license fee, not royalty fee. Overall, the method of this study can be illustrated as in Figure 4.

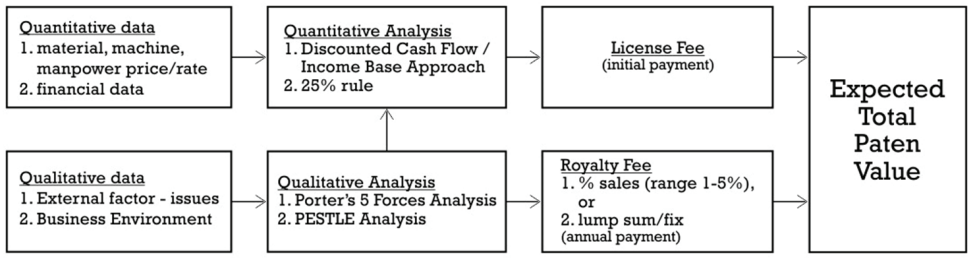


Figure 4. Proposed Method on CSTP Patent Valuation

RESULTS AND DISCUSSION

Porter's Five Forces Analysis

a. Supplier Power

Main production materials for this organic composite board are coconut fibre and PF adhesive. Coconut fiber can be easily found in Indonesia because this country has been known as the largest coconut producer in the world, with 3.88 million hectares of coconut plantation area (Ministry of Industry, 2009). Coco fiber producers are mostly located in North Sumatera, Riau, and East Java.

Phenol Formaldehyde (PF) adhesive have been known for its usage in plywood industry. This adhesive is easily found in Indonesia. There are more than 15 big suppliers for PF Adhesive in West Java. Supplier power is not too strong since there are many options of companies providing the adhesive and they cannot set the price too high.

b. Buyer Power

The potential consumers of this organic composite board are: (1) Landscape builders, (2) Green building contractors, (3) Government institutions, and (4) Individual. With broad target market and limited big competitor (seven companies), buyer has limited bargaining power. Although there are no available data for the vertical garden demand, the trend of using vertical garden in the city is increasing, it can be seen in several building in Jakarta. Moreover, this organic composite vertical garden can be sold as a planting media to target landscape builder and contractor (business to business/ B2B) or as a ready to install vertical garden to target end user or building owner.

c. Threat of Substitution

The threat of substitution for organic composite vertical garden is high. The invention can be substitute by geotextile pocket method of vertical garden product which patented in the US on March 2012 entitled Vertical Garden Panel (United States Patent No. US 8,141,294 B2, 2012). This method is already used by most of vertical garden builder in Indonesia. The geotextile material is also provided by several companies, so it is not difficult to find the material.

d. Threat of New Entry

The threat of new entry for this business is quite low because it will require big amount of capital, knowledge and manpower in construction-landscaping area. A few small size companies can enter this business.

e. Competitive Rivalry

The market competition is not tight, there are only seven companies widely known for their work in Indonesia, which are: Indoneta, Green Art Indonesia, Smart Garden Indonesia, PT. Godong Ijo Asri, PT. Indonesia Green Wall, PT Istana Alam Dewi Tara, and Vertical Garden Alas Ijo. These companies' coverage are mostly in Java and Bali Island, so there is still a large market in Indonesia that has not been engaged.

Porter's Five Forces analysis for organic composite vertical garden can be summarized as in Figure 5. Overall, there are four positive factors and one negative factor to the new business of organic composite vertical garden.

Factors	+/-	Nature
Supplier Power (Low)	+	(+) Availability of main material is abundance. (cocofiber) (+) Material price is low (+) Plenty of suppliers. (+) Suppliers located in many location in Indonesia
Buyer Power (Low)	+	(+) The product can be sell as a a planting media and as a vertical garden, which have 2 consumer target. (+) Limited option for vertical garden provider/builder. (+) Price range is still high, buyer has very limited option of price.
Threat of Substitution (High)	-	(-) Can be replaced by other invention (patented in 2012), which already widely known in Indonesia, it also has automatic watering, nutrition and drainage system.
Threat of New Entry (Low)	+	(+) Required manpower & knowledge in landscape and construction to meet the customer needs (+) Required big capital that cannot be afford by many small companies
Competitive Rivalry (Low)	+	(+) Small number of competitor (7 companies). (+) Market in Java and Bali island is still big. (+) Market in other big islands is still wide open and not yet engaged.

Source: Porter (1985)

Figure 5. Porter's Five Forces Analysis of Organic Composite for Vertical Garden in This Paper

PESTLE Analysis

a. Political Factor

Local government, such as DKI Jakarta has implemented green open space policy (Law No. 26 Year 2007 Concerning Spatial Management). This policy endorsing building owner to have 30% of green open space or park areas. From 30% target, in 2016 government can only provide 14.94% or 9,896.8 hectares from total land area. On the other hand, building owner in the big city tends to utilize most of the building space to generate revenues and neglected this policy. Thus, vertical garden can be a solution to maximize

the green space inside or outside the building to achieve government target.

b. Economic Factor

The economic factors for this business include: material price, market potencies, and selling price-competitor price. As mentioned in Porter's Five Forces analysis above, material for this invention is abundant and cheap (coco fiber and PF adhesive). The price range for coco fiber is IDR 3,000-5,700 per kilogram, depending on location. A big amount of purchasing will reduce the price and transportation cost. PF adhesive price range is IDR 28,000-37,000 per kilogram.

A potential market for vertical garden business is very big in Indonesia. There are still high demand in Java and Bali Island, but there are also big market potencies in Sumatera, Kalimantan, Sulawesi and Nusa Tenggara Islands which has not been entered by big companies. Company such as Godong Ijo already install 8,000 meter square of vertical gardens (worth IDR 16 billion). The price range for their products and services are IDR 1.5-2 million/meter square, there is still huge range of price to squeeze in for new business.

The majority of company in Indonesia are SMEs. There are 57,895,721 SMEs and they provide job for 114,144,082 workers (BPS Indonesia, 2016). Many experts mentioned that the SMEs are the engine for Indonesian economic growth and social welfare. They also can withstand the economic and financial crisis that is why SMEs can strengthen country's economic foundation. Related to this, organic composite vertical garden should be designed to fit the SME business size and capability. The SMEs with adequate capital (>IDR 2 billion), proper knowledge, and manpower in landscape construction would be fit for this business.

c. Social Factor

Indonesia is known for a big population country with more than 260 million people (Budaya - Demografi, 2017) and the population growth of Indonesia was 1.4% (BPS - Kependudukan, 2017). This prompted the demand of land and housing ownership increasing significantly. In the big cities, land value is too high to be used as a garden that is why the number of green space decreased rapidly. Not every household can afford to have garden, but if this invention can create a low price vertical garden, it can have a great impact to the urban society and reach wider market.

d. Technological Factor

This invention is different with the existing vertical garden methods. There are two main competitive values of the product: (1) can be mass produced with more efficient cost, and (2) produced from organic material that is not harm the environment and can be mixed with organic waste. Meanwhile, the others have to be tailor made and produced from synthetic material filled with soil and other organic material. There are six stages in organic composite board for vertical garden production process, which are: preparing coconut

fiber – mixing with adhesive – hot press process – assembling – packing. This production process is already validated to be effective and efficient in pilot scale at Research Centre for Biomaterial.

There are three methods for making vertical garden, which are: simple pot stacking, geotextile/glass wool/ rock wool pocket method, and plastic frame method. In Indonesia, geotextile pocket is the most popular method because it can be used in a large size building and easy to maintain. Table 1 shows the comparison of these three methods and the organic composite board vertical garden.

The organic composite vertical garden has lacking in automated watering, nutrition, and drainage system. This disadvantage is crucial for application in big size building. Manual watering will increase manpower, energy and time cost.

Table 1. Vertical Garden Comparison

Method	Installation	Portable/Static	Watering & Nutrition System	Price	Maintenance
Pot stacking	complex wire and metal frame, stacked one by one	Portable	Manual	Medium	High
Geotextile pocket	Zincallum frame, bolted to wall, install and set timer for watering system	Static	Automated	High	Low
Plastic frame module	Zincallum frame, bolted to wall, install and set timer for watering system	Portable	Automated	High	Low
Organic composite VG	Zincallum frame, bolted to wall.	Portable	Manual	Low	Medium

Source: Gopar (2015)

e. Legal Factor

There are no strict laws enforcing or related to the use of vertical garden, the closest is the draft of ministry regulation regarding green building. The issues of green building has been continuously endorsed by the Green Building Council Indonesia (GCBI). GCBI main concern for green building certification are related to energy efficiency, water efficiency, the use of less embodied energy (heat) material, and green space availability. The use of vertical garden may slightly affect energy and water efficiency but greatly increase the percentage of the use of less embodied energy (heat) material, and green space availability.

f. Environmental Factor

The high intensity of air pollution in city can greatly contributes to the increasing number of disease or health disorder. This is why green space is important to the residence. The trees and plants can transform CO2 and some other pollutants into Oxygen. In near

future, vertical garden is predicted to be a common use in every sky scrapers and public spaces.

PESTLE analysis for organic composite vertical garden can be summarized as in Table 2. The majority issues of each factor in this PESTLE analysis were conducive to the new product of organic composite vertical garden, although there is an important disadvantage related to the technological factor. The disadvantages are lack

Table 2. PESTLE Analysis of Organic Composite for Vertical Garden in This Paper

No	Factor	Issues	Supportive/ Unsupportive	+ / _
A.	**Political Factor**			
	Local government policy	Open Green Space	Conducive	+
B.	**Economic Factor**			
1	The availability & Material Price	Coco fiber	Conducive	+
		PF Adhesive	Conducive	+
2	Market Potency	Domestic Market - Java & Bali Island	Conducive	+
		Domestic Market - Sumatera, Kalimantan, Sulawesi and Nusa Tenggara Island	Conducive	+
3	Product Price	Products and Services range are still high	Conducive	+
4	Business Scale	Fit to SME scale	Conducive	+
C.	**Social Factor**			
	Increasing population	Higher land value, and decreasing amount of green areas	Conducive	+
		To produce low cost vertical garden	Conducive	+
D.	**Technological Factor**			
1	Invention advantage	Low cost and can be mass produce	Conducive	+
2	Invention disadvantage	Lack of automated watering, nutrition & drainage system	Not conducive	-
E.	**Legal Factor**			
	Green Building Certification by GCBI	Energy efficiency	Not conducive	-
		Water efficiency	Not conducive	-
		The use of less embodied energy material	Conducive	+
		Green space availability	Conducive	+
F.	**Environment Factor**	To reduce air pollution effect to human health by providing more vertical garden	Conducive	+

of automated watering, nutrition and drainage system.

The qualitative analysis can be concluded that the business environment is very conducive to the invention. Based on this findings (condition of business environment and related issues), it should be converted into royalty fee rate with range 1-5% that has been explained before. If condition of business environment in Porter's Five Force and related issues in PESTLE analysis were positive, the royalty fee should be higher, and vice versa. The conversion of qualitative analysis into royalty fee rate is as stated in Table 3. With the majority condition of business environment and related issues for organic composite vertical garden are positive/conducive, the royalty fee can be set at 4%.

Table 3. Royalty Fee Rate

5%	Very High	Porter's 5 force & PESTLE analysis all factors (+)
4%	High	Porter's 5 force & PESTLE analysis majority factors (+)
3%	Medium	Porter's 5 force & PESTLE analysis factors balanced between (+) and (-)
2%	Low	Porter's 5 force & PESTLE analysis majority factors (-)
1%	Very Low	Porter's 5 force & PESTLE analysis all factors (-)

Source: Porter (1985)

Discounted Cash Flow (DCF)

The DCF calculation is essential for income based patent valuation (McIntosh, 1993). By using DCF, estimated business value (NPV) of organic composite board for vertical garden patent within its protection period (20 years from 2016) can be calculated. There are several components of DCF calculation not showed in this paper to protect licensor's and licensee's interest. The components include: (1) investment calculation, (2) manpower calculation, and (3) production cost calculation.

Total investment for 8 machineries, utilities, shipping equipment, pre-operation cost, rented land and building: IDR 1.3 billion. In manpower aspect, this business required minimum of 10 labors with annual cost reaching IDR 208 million. In production cost calculation, cost of manufactured goods reached IDR 73,600 for each product, and the selling price estimated 40% gross margin is IDR 123,000.

For further calculation, the DCF consider several factors, such as:

a) This production process require 12 machineries in 1 production line and 10 labors.
b) The business is mainly to sell organic composite board as plant media for vertical garden.

c) The production capacity was estimated in moderate number (50 boards/day or 12,000 boards/year). This business can cover 6,000 meter square of vertical garden demand each year.

d) Payroll is calculated for 13 months in a year due to Idul Fitri incentive (one month salary).

e) Income tax for Small Medium Enterprise (SME) up to IDR 4.8 billion revenue is 1% (Government Regulation No. 46 Year 2013).

f) Loan interest rate for business entity is at 15%.

As a result, there are four calculation tables including: (1) Yearly forecast

Table 4. Yearly Forecast Income Statement of Organic Composite for Vertical Garden in This Paper

YEAR	0	1	2	3	4	...	20	
Capacity		**50%**	**75%**	**100%**	**100%**	**100%**	**100%**	
Production Capacity		6,000	9,000	12,000	12,000	12,000	12,000	
Revenue								
Sales	123,000	738,000,000	1,107,000,000	1,476,000,000	1,476,000,000	1,476,000,000	1,476,000,000	
TOTAL REVENUE		**738,000,000**	**1,107,000,000**	**1,476,000,000**	**1,476,000,000**	**1,476,000,000**	**1,476,000,000**	
Production Cost (cont'd)								
Material		140,520,000	210,780,000	281,040,000	281,040,000	281,040,000	281,040,000	
Utility		86,520,000	129,780,000	173,040,000	173,040,000	173,040,000	173,040,000	
Labor		104,000,000	156,000,000	208,000,000	208,000,000	208,000,000	208,000,000	
Packaging		2,400,000	3,600,000	4,800,000	4,800,000	4,800,000	4,800,000	
Maintenance		4,540,800	6,811,200	9,081,600	9,081,600	9,081,600	9,081,600	
Technical Supervision		6,500,000	9,750,000	13,000,000	13,000,000	13,000,000	13,000,000	
Insurance		80,025,000	120,037,500	160,050,000	160,050,000	160,050,000	160,050,000	
Laboratorium		4,800,000	7,200,000	9,600,000	9,600,000	9,600,000	9,600,000	
Payroll overhead		4,800,000	7,200,000	9,600,000	9,600,000	9,600,000	9,600,000	
Overhead		4,540,800	6,811,200	9,081,600	9,081,600	9,081,600	9,081,600	
TOTAL PRODUCTION COST		**438,646,600**	**657,969,900**	**877,293,200**	**877,293,200**	**877,293,200**	**877,293,200**	
Business Cost								
GSA	**5.00%**	36,900,000	55,350,000	73,800,000	73,800,000	73,800,000	73,800,000	**Accum Royalty**
Royalty	**4.00%**	29,520,000	44,280,000	59,040,000	59,040,000	59,040,000	59,040,000	**1,136,520,000**
Transporting	5,000	30,000,000	45,000,000	60,000,000	60,000,000	60,000,000	60,000,000	
TOTAL BUSINESS COST		**96,420,000**	**144,630,000**	**192,840,000**	**192,840,000**	**192,840,000**	**192,840,000**	
Depreciation								
Machineries	10	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	
TOTAL DEPRECIATION		**50,000,000**	**50,000,000**	**50,000,000**	**50,000,000**	**50,000,000**	**50,000,000**	
TOTAL COST		**585,066,600**	**852,599,900**	**1,120,133,200**	**1,120,133,200**	**1,120,133,200**	**1,120,133,200**	
EBIT		**152,933,400**	**254,400,100**	**355,866,800**	**355,866,800**	**355,866,800**	**355,866,800**	**EBIT AVR**
EBIT (%)		21	23	24	24	24	24	**23.88** %
25 Percent Rule of EBIT		5	6	6	6	6	6	**5.97** %
Other Cost								
Interest rate on Investment Loan		60,018,750	56,017,500	52,016,250	48,015,000	44,013,750	-	
Interest rate on Working Capital Loan		-	-	-	-	-	-	
TOTAL OTHER COST		**60,018,750**	**56,017,500**	**52,016,250**	**48,015,000**	**44,013,750**	**-**	
EBT		**92,914,650**	**198,382,600**	**303,850,550**	**307,851,800**	**311,853,050**	**355,866,800**	
Profit Sharing	10.0%	9,291,465	19,838,260	30,385,055	30,785,180	31,185,305	35,586,680	
Tax	1.0%	929,147	1,983,826	3,038,506	3,078,518	3,118,531	3,558,668	
Net Profit		**82,694,039**	**176,560,514**	**270,426,990**	**273,988,102**	**277,549,215**	**316,721,452**	

income statement, (2) Cash flow, (3) DCF calculation, and (4) Resume.

In yearly forecast, income statement showed that after three years running, business condition will be stable in generating and annual profit is above IDR 270 million. In this calculation, the average ratio of Earning Before Interest and Tax (EBIT) to revenue is 23.88%. While the result of 25% rule of average EBIT is 5.97%, this percentage will be used in license fee calculation later. Furthermore, the

Table 5. Cash Flow of Organic Composite for Vertical Garden in This Paper

YEAR		0	1	2	3	4	...	20
Capacity			**50%**	**75%**	**100%**	**100%**	**100%**	**100%**
Production capacity			6,000	9,000	12,000	12,000	12,000	12,000
Revenue								
Sales	123,000		738,000,000	1,107,000,000	1,476,000,000	1,476,000,000	1,476,000,000	1,476,000,000
TOTAL REVENUE			**738,000,000**	**1,107,000,000**	**1,476,000,000**	**1,476,000,000**	**1,476,000,000**	**1,476,000,000**
Production Cost								
Material			140,520,000	210,780,000	281,040,000	281,040,000	281,040,000	281,040,000
Utility			86,520,000	129,780,000	173,040,000	173,040,000	173,040,000	173,040,000
Labor			104,000,000	156,000,000	208,000,000	208,000,000	208,000,000	208,000,000
Packaging			2,400,000	3,600,000	4,800,000	4,800,000	4,800,000	4,800,000
Maintenance			4,540,800	6,811,200	9,081,600	9,081,600	9,081,600	9,081,600
Technical Supervision			6,500,000	9,750,000	13,000,000	13,000,000	13,000,000	13,000,000
Insurance			80,025,000	120,037,500	160,050,000	160,050,000	160,050,000	160,050,000
Laboratorium			4,800,000	7,200,000	9,600,000	9,600,000	9,600,000	9,600,000
Payroll overhead			4,800,000	7,200,000	9,600,000	9,600,000	9,600,000	9,600,000
Overhead			4,540,800	6,811,200	9,081,600	9,081,600	9,081,600	9,081,600
TOTAL PRODUCTION COST			**438,646,600**	**657,969,900**	**877,293,200**	**877,293,200**	**877,293,200**	**877,293,200**
Business Cost								
GSA	5.00%		36,900,000	55,350,000	73,800,000	73,800,000	73,800,000	73,800,000
Royalty	4.00%		29,520,000	44,280,000	59,040,000	59,040,000	59,040,000	59,040,000
Shipping	5,000		30,000,000	45,000,000	60,000,000	60,000,000	60,000,000	60,000,000
TOTAL BUSINESS COST			**96,420,000**	**144,630,000**	**192,840,000**	**192,840,000**	**192,840,000**	**192,840,000**
TOTAL COST			**535,066,600**	**802,599,900**	**1,070,133,200**	**1,070,133,200**	**1,070,133,200**	**1,070,133,200**
Other Cost								
Interest								
Investment Loan Installment	15		44,458,333	44,458,333	44,458,333	44,458,333	44,458,333	
Investment Loan Interest	9%		60,018,750	56,017,500	52,016,250	48,015,000	44,013,750	
Working Capital Loan Installment				-				
Working Capital Loan Interest				-				
Profit Sharing			9,291,465	19,838,260	30,385,055	30,785,180	31,185,305	35,586,680
TOTAL OTHER COST			**113,768,548**	**120,314,093**	**126,859,638**	**123,258,513**	**119,657,388**	**35,586,680**
Tax			7,380,000	11,070,000	14,760,000	14,760,000	14,760,000	14,760,000
TOTAL COST			**728,860,148**	**1,042,951,493**	**1,357,042,838**	**1,353,441,713**	**1,349,840,588**	**1,265,769,880**
Surplus / Deficit			**9,139,852**	**64,048,507**	**118,957,162**	**122,558,287**	**126,159,412**	**210,230,120**
Capital & Loan								
Main Investment		1,333,750,000						
Investment Cost	50%	666,875,000						
Investment Loan	50%	666,875,000						
Working Capital	2		144,382,200.00	-	-	-	-	-
Total Capital & Loan		**1,333,750,000**	**144,382,200**	**622,416,667**	-	-	-	-
Net Cashflow			**1,342,889,852**	**2,029,355,025**	**2,148,312,187**	**2,270,870,473**	**2,397,029,885**	**5,069,887,102**

total of estimated royalty fee (4%) from sales revenue within 20 years is IDR 1.1 billion.

Table 5 illustrates the projection of future cash flow twenty years ahead. It shows that the business is profitable enough, it remain surplus even in the first year, not too big but it is adequate for the SME's business scale. As seen in Table 5, the surplus continues to rise. This calculation will be continued with DCF calculation.

Table 6. Discounted Cash Flow of Organic Composite for Vertical Garden in This Paper

YEAR		0	1	2	3	4	...	20
Sales on revenue		-	738,000,000	1,107,000,000	1,476,000,000	1,476,000,000	1,476,000,000	1,476,000,000
Investment Capital		(1,333,750,000)						
Working Capital			(144,382,200)					
Total Capital		(1,333,750,000)	(144,382,200)	-	-	-	-	-
Costs								
- Production Cost		-	438,646,600	657,969,900	877,293,200	877,293,200	877,293,200	877,293,200
- Business Cost		-	96,420,000	144,630,000	192,840,000	192,840,000	192,840,000	192,840,000
- Financial Cost		-	113,768,548	120,314,093	126,859,638	123,258,513	119,657,388	35,586,680
Total Cost			**648,835,148**	**922,913,993**	**1,196,992,838**	**1,193,391,713**	**1,189,790,588**	**1,105,719,880**
Net Cashflow		(1,333,750,000)	(55,217,348)	184,086,007	279,007,162	282,608,287	286,209,412	370,280,120
Net Cashflow Accumulated		(1,333,750,000)	(1,388,967,348)	(1,204,881,342)	(925,874,180)	(643,265,893)	(357,056,482)	4,716,550,735
NPV	8%	**1,229,876,073**						

Table 6 shows the projection of future cost and benefit within twenty years. In order to get the NPV, the cost and benefit was calculated as net cash flow accumulated (IDR 4.7 billion) then multiplied with the highest interest rate for investment in a regulated financial instrument (bank deposit, ORI, Sukuk, etc.) which was 8%. As a result, the NPV for organic composite vertical garden business is IDR 1.2 billion.

Table 7 shows all DCF features commonly used for business feasibility study or investor information kit. The advantage of valuation using DCF is that we can have a comprehensive perspective related to the business, not just for the product or technology. Overall, this business is quite attractive, although it will take almost 4 years to reach Pay Back Period (PBP).

Patent Value

Total patent value for organic composite vertical garden consists of license fee and the projection of accumulated royalty fee within twenty years. The concept of license fee calculation in this study is how much money that licensor can get from licensee by utilising licensor's patent, as a proper share from business value within patent's

lifetime. The NPV result in the DCF calculation represent business value within patent lifetime, and the result of rule of 25 percent represent a proper share for the licensor. As a result, the license fee calculation: (25% x EBIT) x NPV = 5.97% x IDR 1.2 billion= IDR 106.4 billion. Rounding number of License Fee value = IDR 106.4 million. The estimated accumulation of Royalty fee (4% of Sales) within twenty years is: IDR 1.14 billion. The total of patent value is about IDR 1.2 billion (IDR 106.4 million plus IDR 1.14 billion).

This result was discussed with the group of inventors of organic composite of vertical garden from Research Centre for Biomaterial and technology transfer team from Centre for Innovation - CSTP, and this calcula-

Table 7. Discounted Cash Flow Calculation Resume of Organic Composite for Vertical Garden in This Paper

INVESTMENTS		
Machineries	Rp	500,000,000
Utility	Rp	60,000,000
Shipping equipment	Rp	143,000,000
Land and Building	Rp	460,000,000
Pre-ops cost	Rp	170,750,000
	Rp	**1,333,750,000**

LABOR		
Labor		10 man
Monthly cost	Rp	16,000,000
Annual cost	Rp	208,000,000

MONTHLY PRODUCTION COST		
Material	Rp	23,420,000
Utility	Rp	14,420,000
Labor	Rp	16,000,000
Packing	Rp	900,000
Maintc., As., Lab, o.head, dll	Rp	756,800
	Rp	**55,496,800**

PRODUCTION CAPACITY	
daily	50 board/day
monthly	1000 board/month
yearly	12000 board/year

BREAK EVEN POINT ANALYSIS	
BEP	1.09
ROI	9%

REVENUE			
Production Price	Rp	72,191.10	/board
Selling Price	Rp	123,000.00	/board
Revenues	Rp	123,000,000	/month

PAY BACK PERIOD		
Total Capital Investment	Rp	1,333,750,000
PBP		**44.97** month

IRR & NPV		
IRR		**17.00%**
NPV	**Rp**	**1,229,876,073**
LICENSE FEE	**Rp**	**106,384,280.34**

tion was well accepted. Afterwards, the calculation will be used in a negotiation meeting with the potential licensee.

CONCLUSION

From the qualitative analysis, most of the components in Porter's Five Force and PESTLE analysis are positive. This describes that the condition of business environment related to organic composite vertical garden patent is conducive to operate. Furthermore, the result of quantitative analysis calculated the total of patent value of IDR 1 billion. This is acquired from adding license fee and the accumulation of royalty fees within 20 years (patent protection period). License fee was calculated using rules of 25 percent from EBIT percentage compared to revenue, and multiplied with NPV, and the result is IDR 106.4 million. The accumulation of the expected royalty fees (4%) within 20 years will be IDR 1.14 billion. This result was well accepted by the inventors and technology transfer team.

In this practical use, this method is a very strong and comprehensive tool for negotiating with investors. It also gives overview of business environment and important issues related to the business. Moreover, the DCF calculation can produce reliable result of the business value as a platform in acquiring patent's value. This method is ideal for CSTP or other government technology intermediaries because it only needs small effort, cost, and manpower. Another advantage of using income based valuation approach is that the investor can have a clear perspective regarding required investment and feasibility of the business.

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