Hard to value intangibles

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In this case study, we provide an illustration of a situation whereby a willing seller and a willing acquirer are considering entering into a transaction that involves the transfer of hard-to-value intangibles. We also describe how various valuation models may be applied in this context and discuss the limits of the approach.

Section 1. provides a summary of the facts. Section 2. discusses the selection of the method. Section 3. presents the financials and the application of the methods.[1]

1. Summary of the facts

Companies A and B are part of a multinational enterprise (MNE) and are located in two different countries. Company A hosts the management of the group and some IT teams. It has made investments in relation to an IT solution called Solution X which is a software that is specifically dedicated to the operations of the group and cannot be used nor sold directly to the market. It has practically no value outside the scope of the MNE. Solution X will be rolled out within the group, and some affiliates of the MNE that will use it will be paying a licensing fee for their rights to do so.

As part of a strategic decision, group-wide IT developments are to be centralized in an "IT hub" hosted by Company B in the future. The latter has the required competencies in terms of human resources (including engineers and management) to manage the development for a number of solutions. Although it was Company A that developed the original concept of Solution X without assistance from other group affiliates, further development of this solution needs to be undertaken. The group expects that, in moving responsibilities for this project from Company A to Company B, development will benefit from the expertise and synergies with the other projects being managed by Company B. Company A is considered to be a willing seller of Solution X. The small team of engineers at Company A that is working on Solution X will be transferred to Company B. This transfer of a team is not in the scope of the valuation being considered here.

With respect to the development of Solution X, it is anticipated that **three more years of development** are needed prior to being able to launch the product. In practice, these developments are going to involve both the time and investments of Company B's team as well as some dedicated resources in affiliates of the MNE in a few countries (including the pilot countries where the solution will be tested first; however, the tests will not be limited to those countries only). The group's development team expects the annual development costs to be equal to **50 million € per annum (over the three years)**.

1 The authors would like to thank Hugo Chary and Vladimir Starkov for their valuable contributions. This article only reflects the views of the authors and not that of the reviewers or that of NERA Economic Consulting.

At this stage, the MNE's IT engineers estimate the **useful life** of Solution X to be **six years after launch**. That is, after this period, Solution X could be obsolete as new technologies and systems may become available. At this stage, it is not anticipated that Solution X will be relied upon as a platform for future technologies, and it is estimated that, in a few years, new large investments will be needed to come up with a replacement version. By that time, Solution X will no longer be relied upon as part of this new solution.

There is, nevertheless, a significant uncertainty surrounding the development of Solution X. First, IT costs and investments to maintain and operate the solution are difficult to predict. Given the nature of the technology, the number of IT and engineering hours needed to develop Solution X are difficult to estimate. Second, whilst a number of affiliates have expressed interest in the solution, the final number of affiliates that may adopt it is not certain at this stage which, in turn, makes pricing the license rights for its usage difficult. This means that, depending on the success of the rollout, there is a non-zero probability that the licensing revenues are lower than the post deployment maintenance and operational costs. Furthermore, it is only after three years of investments in development (at a cost of 50 million € per year) that the company will have more information about the potential feasibility and profit potential of Solution X.

Below are additional assumptions relied upon for the purpose of the analysis.

	Optimal	**Comp. A**	**Comp. B**						
Capital structures	50% – 50%	60% (E) – 40% (D)	20% (E) – 80% (D)						
Risk Free Rate	1%								
Beta	1								
ERP	6%								
	AAA	AA	A	BBB	BB	B	CCC	CC	C
i rate	2%	3%	4%	5%	6%	7%	8%	9%	10%
Tax rate	30%								

Development for Solution X is to be transferred to Company B on 31 December 2018. The objective of this case study is to illustrate the issues surrounding the use of valuation techniques in the context of these hard-to-value intangibles.

2. Selection of the valuation method

In terms of valuation methods, there are several possibilities that enable pricing an intangible; however, a discussion about every such method is outside the scope of this case study.[2] Instead, we provide an overview of the main approaches in the

2 Additional discussion of valuation approaches relating to intangibles can be found in : Leonard, G. and Stiroh, L. (2005). *Economic Approaches to Intellectual Property policy litigation and management*. White Plains, NY: National Economic Research Associates, Inc.

table below that can be employed and include some considerations for each of these methods.

Approach/Parameters		Considerations
Income-Based Approach	Determination of the royalty rate – Relief from Royalty,[3] CUP or Profit Split	Relief from royalty or CUP will likely result in a flat royalty rate unless adjustments are made. It does not factor in the role of the licensees in developing the intangible unless adjustments are made.
	Determination of the royalty rate – Return on asset approach/TNMM	This approach implies that the remuneration of the intangible owner can be benchmarked. This approach may be suitable for some intangibles but probably not in this context because the intangible in question is not sold in the market.
	Discount rate	The discount rate needs to reflect the appropriate level of risks associated with the intangible from the perspectives of the buyer and the seller
	Terminal value	If the technology is a platform intangible, then a terminal value may be considered (or a buy-in).
Replacement / Replication Cost		Applying this method would involve simulating Company B's costs (including opportunity costs) to re-create the asset. Method may be helpful in estimating Company B's maximum willingness to pay. Historical cost approach likely to be irrelevant in this context.
Market-Based approach		It is likely that limited or no data on similar transactions are publicly available given the nature of intangibles
Approaches reflecting uncertainty		Real options (decision trees or Black & Scholes), scenario analyses, and Monte Carlo simulations may enable to factor in additional information that may become available at later stages and reflect the uncertainty, to some extent.

In the case at hand, if one were to use the relief from royalty approach or one of its variants, a key parameter is the estimation of the royalty rate that would remunerate the technology owner once the product is rolled out. In this particular case, and assuming the absence of comparable uncontrolled transactions that can be relied upon to estimate the royalty rate, we would expect that the royalty rate will be determined using the residual profit split method. In this specific case, this method would likely enable factoring in the investments made by both the licensor and the licensees in order to develop the technology.

3 Whilst we have included the relief from royalty in the Income Based Approach category, it is not an income-based method, strictly speaking; it may be referred to as a hybrid method as it includes features of the replacement cost approach.

Whilst a detailed explanation of how the profit split method may be implemented in this context is beyond the scope of this case study, it may be possible to consider a split factor based on the relative investments made by the licensor and the licensee and the useful life of those investments. In other situations, the Comparable Uncontrolled Price (CUP) method may be relied upon if a suitable comparable license fee can be estimated. Then, once the royalty is determined and costs to be incurred by the licensor to exploit the intangible are identified, it is possible to apply the DCF approach to determine the value of the assets.

Prior to discussing the financial aspects and illustrating the application of the methods, it is important to discuss the applicability of other methods, one of which is the replacement cost approach. The OECD Transfer Pricing Guidelines seem to have concerns about the use of cost-based methods. For instance, paragraph 6.142 of the Transfer Pricing Guidelines states that:

> The use of transfer pricing methods that seek to estimate the value of intangibles based on the cost of intangible development is generally discouraged.

It is likely that, in this statement, the OECD is referring to historical costs. In practice, if the replacement cost approach (which is different from the use of historical costs) is properly applied, it may offer an indication of value. Too often, replacement costs are confused with the use of historical accounting cost. Historical cost may not be reflective of what the acquirer would need to incur to be able to develop the solution. However, if one considers the economic costs that the acquirer would need to bear in order to re-create the solution (including the forgone profits of not having that solution while recreating it – e.g., price premium, volumes, efficiency, *etc.*), this may provide a reasonable answer.

Replacement costs need to be viewed as the investments that are needed to recreate a similar asset. Such investments are likely to include the opportunity cost of time of the development teams, the time of the management that is needed to supervise, and the development and other applicable costs. The replacement cost approach, therefore, may be used in some circumstances to estimate the maximum price that the acquirer would be willing to pay. Indeed, all things being equal, a profit-maximizing firm will choose the least costly way (considering the opportunity costs) to obtain an asset. A prospective acquirer will not pay more than the lesser of (i) the expected cost to create that asset itself, and (ii) the expected incremental benefit of having that asset relative to the next-best alternative.

At the same time, tax authorities may be interested in knowing the costs that Company A has incurred prior to the date of the transaction. However, it is not certain that such costs are relevant in this context. At the time of the intangibles transfer, such costs may be considered as sunk costs; there is nothing that can be done by Company A in the future to recoup these costs other than selling the asset. If the market value of the development of Solution X is below the costs incurred by Company A, this simply means that the NPV of the project is negative for Company A. It does not mean that it should not sell as it should consider its best alternative. If selling offers a better alternative than continuing the investments on its own or stopping the development altogether, Company A would likely sell. Nonetheless, the value of the in-process intangibles sold by Company A to Company B should be accounted for in a valuation method based on the income approach, such as the residual profit split.

Hence, in the case at hand, the DCF can be a viable approach. However, this method may not fully factor in the uncertainty that is associated with this investment. For this reason, we have also considered other methods that model the impact of uncertainty on the valuation.

The application of these approaches is described in the section below. Whilst we are illustrating how these methods can be applied, this does not mean that these methods should be mechanically applied in every case. Method selection in a transfer pricing setting should always be driven by facts and circumstances.

3. Application of the methods

3.1. Application of the DCF Approach

As with any DCF application, various parameters need to be considered. The first one relates to the expected future cash flows. We assume, for simplicity, that cash flows are equivalent to profits.

There is a number of ways to estimate the profit associated with Solution X, for example, the residual profit split method can be useful to determine the applicable royalty rates. The use of this method enables factoring in the variable royalty rates, if relevant. This may be more difficult to do with the use of a CUP method, for example. In regards to the costs, in principle, these should include all of the costs that the acquirer would incur going forward from the development of Solution X and its licensing. This includes development costs, the administrative cost associated with managing and licensing the intangible, and corporate income tax.

As previously mentioned, in our stylized example, there is significant uncertainty associated with the revenues and costs associated with Solution X. The purpose of this case study is not to assess the arm's length license fee for the use of Solution X but, rather, to determine its value in a one-shot transfer given the expected license fee.

Let us assume this profit (once the solution is being exploited) to be as low as –40 million € or as high as 110 million € per annum (during the operational life of six years). In the application of the DCF, the term "expected" in "expected future cash flows" is important as it refers to the average value of the future cash flows.

Let us assume that, in the case at hand, the expected cash flows are negative in the first three years (-50 million € per year, corresponding to the development costs) and that probability weighted profits for the subsequent six years (i.e., the lifetime of Solution X) are 35 million € per year.

The second parameter relates to the discount rate. A commonly used discount rate in such analyses is the weighted average cost of capital (WACC) which we assume equal to 8% in the case at hand.[4] Other discount rates can also be relied upon. For example, if one considers that developments related to Solution X are only funded through equity, then using cost of equity (rather than WACC) may be preferable over using the weighted average cost of capital. Practitioners have also relied on the weighted average return on assets. The discount rate can reflect the access to funding as well as an element of uncertainty. Furthermore, uncertainty can be accounted for in the projection in terms of costs to be incurred (both the amount and the timing) and revenues to be obtained (again, both the amount and the timing). Particular attention should be made not to account twice for uncertainly (in the discount rate and the cash flows). In the case at hand, uncertainty has been accounted for in the cash flows by using the probability weighted expected values.

		2019	2020	2021	2022	2023	2024	2025	2026	2027
Intangible Related Profits (assume = cash-flow)	[1]	**-50**	**-50**	**-50**	**35**	**35**	**35**	**35**	**35**	**35**
Discount factor (8% – mid year convention)	[2]=1/ $(1+8\%)^{n-0.5}$	0.96	0.89	0.82	0.76	0.71	0.65	0.61	0.56	0.52
NPV in year n	[3]=[1]x[2]	**-48**	**-45**	**-41**	**27**	**25**	**23**	**21**	**20**	**18**
Total NPV in 2019	[4]=sum of [3]	**0**								

The calculations above show that the net present value from Company B perspective is 0. This triggers an important question: Should the transfer of the software from Company A to Company B take place at a price of 0?

The answer is likely to be no. The reason for this is that this method does not factor in a number of aspects. In particular, it does not account for the fact that there is a significant uncertainty about this development. This means that there is a non-zero probability that the outcome turns out to be better than the above (or worse) and that the acquirer ends up with a better scenario. This, in itself, would not lead to a higher value per se if there is a similar probability that the outcome turns out worse than stated above.

4 This corresponds to an after tax WACC of Company B (using a tax rate at 30%), assuming optimal capital structure, and BB credit rating.

3.2. Application of the DCF approach using Monte-Carlo simulations

One better way to account for uncertainly in the cash flows is by using Monte Carlo simulations. In the above example (traditional DCF), we used the probability weighted expected value of the cash flow to account for the risk. This information might not be available and/or be difficult to assess. Monte Carlo simulations offer a robust solution to this element by randomly simulating a multitude of cash flow scenarios.[5] The uncertainly that can be accounted for in this case relates to the profit volatility which, we assume, can be as high as 110 million € and as low as –40 million €. In practice, there is a number of ways to apply those simulations as all model input can be randomized.

For the purpose of the application of this method, we have randomly simulated 4 000 scenarios, the profit of which varies between –40 million € and 110 million € and calculated the NPV using an 8% discount factor. The results, as presented in the figure below, provide that the value of Solution X is also nil. The figure below presents the distribution of its value resulting from the 4 000 simulations.

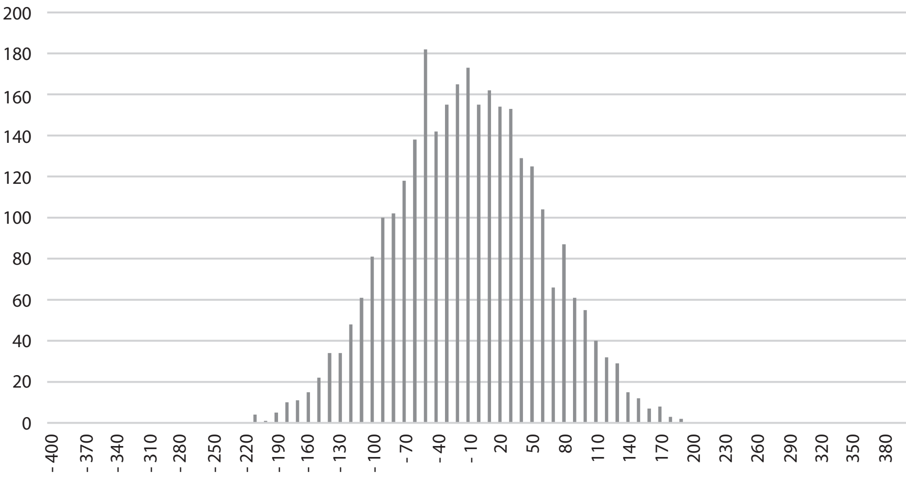

Figure: Monte Carlo Sumulations Results

The results are in line with the traditional DCF method as Monte Carlo simulation simply enables obtaining and documenting an estimation of the cash flows on the basis of the acute volatility that is proper to the intangibles at hand.

5 For a detailed discussion on Monte Carlo simulations, see, for instance, Vose, D. (2000). *Risk analysis A quantitative guide*. 2nd ed. Chichester: John Wiley & Sons Ltd, pp.16–17; 57–65.

Does this mean that the value of Solution X is nil and that this is the price a seller is willing to accept and an acquirer ready to pay? Here again, the answer is likely to be no. We should recall that there is a three-years period during which the acquirer will gain more certainly about the technology it is developing. During this period, the acquirer may be able to alter its investment decision so as to optimise its future cash flows. For example, it has the option to stop or reduce its post-deployment investments or costs to scale them up to achieve the maximum expected returns. In addition, whilst it is not expected that the technology can be relied upon after six years of exploitation, it may be that, through the centralization of the IT solution development in Company B, other uses of Solution X technology becomes possible. Company A, given its functions and position, may not be able to capture this additional value.

3.3. Application of the real option method using Black and Scholes

One other way to model the impact of uncertainty on decision making is to use option pricing methodology.[6] In this case study, we are using the Black-Scholes model. There are alternatives to this model (such as the use of a decision trees type of analysis). The use of option pricing here fits well since there is an estimated time frame during which the acquirer has the possibility to alter its investment decision as more information becomes available prior to roll-out (three years, in this case). In other situations when information comes at a different point in time, it may be preferable to rely on another approach such as decision trees.

In finance, a financial option – such as a call on a stock– provides the owner with the right but not the obligation to purchase shares of the stock on a certain date. The decision of whether to exercise the option is made only after the owner of the option gathers additional information about the future value of the stock. If the stock is worth more than the agreed future purchase price (strike price), the owner of the option should exercise the right to purchase the stock at the strike price and sell it at market price to obtain a profit. If the stock is worth less than the strike price, the option should be allowed to expire at no additional cost to the owner. Similar to financial options, a real option provides the owner with the right but not the obligation to invest in an asset after gathering additional information about the technical and market uncertainties associated with the technology.

6 For a detailed discussion on real option models, see, for instance, Samis, M., Davis, G., Laughton, D. and Poulin, R. (2005). Valuing uncertain asset cash flows when there are no options: A real options approach. *Resources Policy*, 30(4), pp.285–298. See also Lambrecht, B. (2017). Real options in finance. *Journal of Banking & Finance*, 81, pp.166–171.

In the case at hand:

- Company B takes the risks that the revenues may be lower than expected and that the costs may be higher than expected
- Company B may also benefit from lower-than-budgeted costs and higher-than-expected revenues
- If it acquires the intangible, Company B has the option of deciding whether to continue the development of Solution X. In this context, it is getting three more years to make that decision. In practice, the same applies to Company A if it were to retain the asset.
  In the table below, we show how the key parameters of a real option (using Black and Scholes) compare to the key parameters of a financial option.

Financial Call Option	**Real Option**
Stock price	Present Value of expected cash flows after commercialization
Exercise price	Expenses required to commercialize the solution
Time to expiration	Expected time to commercialization
Risk free interest rate	Risk free interest rate
Standard Deviation of stock returns	Standard Deviation of expected returns

The results of the model are based on several inputs. In this case, the present value of the pre-commercialisation expenses in 2022 will be 165:

		2019	**2020**	**2021**	**2022**
Pre–commercialization expenses	[1]	–50	–50	–50	
Capitalization Factor (8% – mid–year convention)	[2]=$(1+8\%)^{n+0.5}$	1.28	1.02	1.00	
Expenses in 2022 value	[3]=[1]x[2]	–64	–51	–50	
Total PV at 2022	[4]=sum of [3]				–165

The present value of the post-commercialization cash flows in 2019 will be 134:

		2022	**2023**	**2024**	**2025**	**2026**	**2027**
Post–commercialization Cash flows	[1]	35	35	35	35	35	35
Capitalization Factor (8% – mid–year convention)	[2]=$1/(1+8\%)^{n-0.5}$	0,76	0,71	0,65	0,61	0,56	0,52
Cash flows in 2019 value	[3]=[1]x[2]	27	25	23	21	20	18
Total PV at 2019	[4]=sum of [3]	134					