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Abstract:

Businesses engaging in outsourcing of professional service activities to organizations in foreign countries have focused primarily on the issues of cost and the number of jobs affected. However, significant transfers of intangibles occur in many service-based offshoring arrangements as well. Some of these intangibles are considered to be intellectual property (IP). The transfer of intellectual property that accompanies such offshoring arrangements can have significant value, making it important to understand risks of loss, obligations of taxation, and contributions to the profit-making potential of an enterprise. Software is an important and often under-valued component of such transfers of intellectual property. This overview paper offers an interdisciplinary examination of intellectual property valuation issues and a business perspective for considering software valuation in the context of offshoring decisions and practices.

Keywords: intellectual property, intangibles, software, valuation, outsourcing, offshore, offshoring, risk, taxation, tax haven

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I. INTRODUCTION

Real and intangible assets are the building blocks of a company. While the importance of intangible assets in knowledge-oriented businesses is well established, legal and accounting definitions are still evolving. Traditionally, in the U.S., the book value of a company, as presented in formal terms, has virtually ignored intangibles. Acquired intellectual property and goodwill are shown, as well as capitalized software development costs. International financial reporting standards allow intangibles to be shown, but they are often omitted or poorly valued.

We focus on the need to value technological intellectual property (IP), an important class of corporate intangible assets. We examine software and related property in particular, and introduce and assess methods that can be used for valuing such assets. The fact that software is maintained and changes over its life, presents an additional complication. Several valuation methodologies applicable to software intellectual property are compared, and the parameters needed for estimating its value are cited. The life of the intellectual property inherent in software is an important parameter in a valuation exercise, and means to assess its life are sketched. Subsequently, the complementarities of the methods are discussed.

The specific discussion focuses on intellectual property (IP) transferred in the context of offshored services. Three alternative organizational structures for hosting IP for offshore use are described: corporate offshore operations; controlled foreign corporations; and independent foreign companies. Each alternative implies a different degree of control over transferred IP, different tax considerations, and a different level of exposure to IP-related business risks. The implications for transfers of technology intellectual property, particularly software intellectual property, to these different types of organizations are then examined. The first and second alternatives ultimately involve the same corporation, whereas the third alternative involves an external corporation.

With this background, we revisit the motivating issue: why software IP should be valued in general and specifically in the context of offshoring. The paper then addresses the question of the barriers and the lack of motivation to routinely consider IP issues at adequate depth, and argues for more deliberate consideration of IP issues specifically in decisions related to offshoring.

The primary contribution of this paper is to make explicit the importance to the enterprise of adequate valuation of software intellectual property. With a better understanding of software value comes the ability to better address the tax and financial implications of software IP-related transactions, manage associated risks, and exploit software IP in a more optimal fashion. The paper provides another key contribution by presenting a framework for decision-making regarding alternatives for both software IP valuation methods and relationship models with offshore organizations that will host the software IP.

II. INTELLECTUAL PROPERTY IN MODERN ENTERPRISES

Intangible Assets

Intangibles of a business are all assets that are neither physical nor financial objects [Baruch 2001]. Such assets include marketing intangibles such as trademarks and trade names, as well as intellectual property such as know-how and trade secrets. In modern knowledge–based enterprises, these intangibles are the primary business drivers. The role of these assets is to generate income at a level that exceeds reimbursement from the labor expended, the use of commodity products, and the margins expected in routine business operations. Owners and stockholders acknowledge this fact by recognizing a market value of a company as being distinct from its book value, which focuses on tangibles. In 1982, intangibles contributed about 40 percent of firms' value. By 2002, 75 percent of the market value of all U.S. firms was attributable directly to intangibles, while tangible assets accounted for only the remaining 25 percent [Kamiyama et al. 2006].

Just like tangible property, intangibles must be continuously maintained and renewed, but at a rate that is roughly twice the rate of tangible assets [Nadiri and Prucha 1996]. The effective management of intangibles is hindered by the lack of consistent metrics and the difficulty of identifying the paths from intangibles to profitability.

Intellectual property (IP) is the subset of intangibles that can be owned by an enterprise, and includes patents, copyrighted documents, and trademarks, as well as documents, software, and related knowledge covered by trade

Communications of the Association for Information Systems

secrets. An important intangible that is excluded from IP assessments is the general knowledge that workers possess; however, enterprise-specific knowledge that is covered by nondisclosure agreements can be considered to be IP. Employees engaged in innovative work should increase the IP of a business. By exploiting IP, companies can gain market share and increase revenue margins. Sharable IP is a bargaining chip for access to complementary technologies—which in turn supports the base objectives [Kaplan and Norton 2004]. IP is also leveraged in acquiring financing for new ventures. Strategic IP management—the ability to protect a company's IP and exploit it to the fullest extent—is becoming increasingly important [Cobourn 2007].

Enterprises are much more likely to have considered issues concerning IP protection than valuation issues. Since many IP assets, and certainly software, are easy to replicate and transfer, it is clear that they must be protected. IP that is covered by patents and copyright is identifiable and easier to manage, but such IP is also visible to competitors. To keep IP away from prying eyes, most business and process documentation, as well as software, is protected as trade secrets. Unless an obligation to publish code exists, trade secret protection is common for software code. Open-source software is excluded from our definition of IP, but its integration and exploitation within larger systems can add considerable value.

Although compelling, IP valuation of technological assets is not routine within many organizations. A 2007 study performed by Micro Focus and INSEAD highlights the current state of affairs: Of the 250 chief information officers (CIOs) and chief finance officers (CFOs) surveyed from companies in the U.S., UK, France, Germany, and Italy, less than 50 percent had attempted to value their IT assets, and more than 60 percent did not assess the value of their software [Kwan and Stafford 2007]. Software has been termed as the "last remaining hidden corporate asset."

When the topic is addressed, lawyers, vendors, and promoters try to quantify software benefits; the results are inconsistent and rarely helpful [Lev 2001]. Currently, the most thorough valuation occurs during mergers and acquisitions (M&A) when entire software companies must be valued. In those cases, market capitalization provides a base for the aggregated value of all of the IP being acquired. The difference between the purchase price and the market value is assigned to goodwill. This paper does not address book values for software acquired in mergers.

Transferring and Sharing of Intellectual Property

Intellectual property can be exploited by transferring it to new settings where it might be used to open up new international markets or to offer new business value in countries with lower labor costs. Without transfer of IP from the sponsoring originators to the users, many offshoring projects would not be feasible [Cronin et al. 2004]; even a simple service project as a call center derives its capabilities to a large extent to the IP that is being provided [Walden 2005]. In more complex arrangements, say cross-border development and licensing of software, the need to manage a company's IP acquires greater importance. In those cases, further concerns about allocation, security, and taxation arise, as considered later in this paper.

At this point, it would be appropriate to clearly distinguish between outsourcing, offshoring, and near-shoring. While politicians frequently use the term *outsourcing* in the context of jobs going abroad, outsourcing just means having another company doing a particular task for the sponsor company [Gupta 2008]. As such, outsourcing encompasses work done within the country as well as abroad. Some issues that would benefit from IP valuation arise in domestic outsourcing as well.

Offshoring means having the particular task performed in a foreign country [Gupta 2008]. This paper focuses on offshoring to illuminate the important additional valuation issues that arise primarily when the user or the host company resides in a foreign country. Near-shoring indicates that work is conducted in a nearby foreign country; this could be Mexico in the case of a U.S. sponsor company. The effects on the need of IP valuation differ little, so that in this paper we will use the broader term, *offshoring*, to mean outsourcing to a foreign country regardless of its location relative to the sponsor company. We include scenarios where the work is performed abroad by captives of the U.S. sponsor company.

While offshoring of jobs now permeates the economies of developed and developing countries, the effect of providing IP created originally by offshoring sponsors to their offshore service companies may greatly exceed the long-range economic effect of job transfers to those offshore service providers [Economist 2007].

As relationships with offshore entities grow, new IP is created. For example, when a company has offices in several countries, work on a particular project may be performed in several countries. While it is the same company, the issue of valuation of the results obtained in different countries arises, for example, to meet the needs of tax authorities of the concerned countries or to decide in which country or countries to file patent applications.

When distinct companies are involved—either independent companies or controlled foreign corporations, the foreign entities may be both users of the IP and contributors to IP. The ownership of prior and new IP depends on the contractual arrangements between the sponsor and the service providers who use that IP. With multiple participants segregating IP by investment source and the locale of its origination, and then charging for the use of the IP, the situation becomes more complex. Now IP valuation, a prerequisite to allocation, becomes essential.

In order to address these types of issues, one approach is to set up a hosting company to hold the rights to all IP relevant to the offshoring agreement, as shown in Figure 1. Such a company is typically a business unit fully controlled by the sponsor. The role of this company is to receive and distribute income generated by the IP it holds and to pay all costs for further IP creation. The actual expenses incurred by the sponsor's and the service provider's R&D efforts are reimbursed by the IP host company, and ownership of all new IP also accrues to this host. The host holding the IP also garners the benefits of using that IP, as a share of revenues from products and services being sold that use that IP. Those benefits can be collected either as royalties for use of the IP or as a share of the income from sales at the user sites.

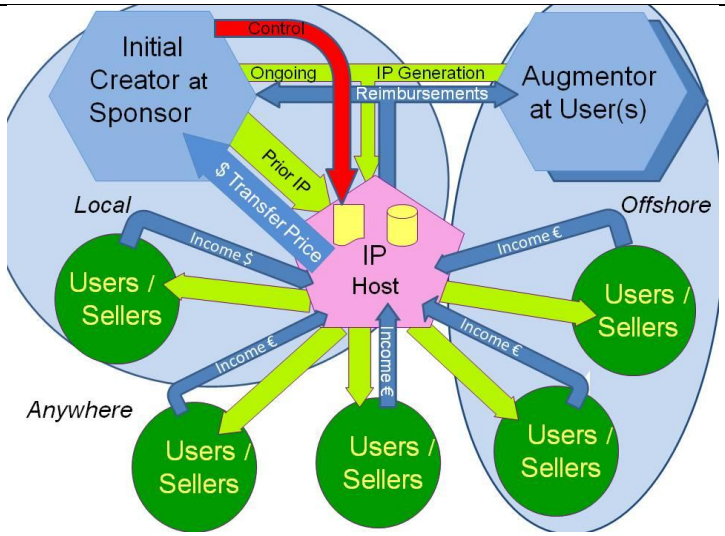

Figure 1. Participants in IP Creation and Consumption

If a product is augmented in a locale specifically for use in its own region, then both those costs and the specific benefits should be assigned solely to the participant in that region.

Note that IP can flow to any place where sales can be made and profits can be accumulated. For our discussion, the difference between near-shoring and global offshoring is of little concern, since the management of IP becomes more complicated when the IP is available at sites where laws, regulations, taxation, and attitudes concerning intellectual property differ. At the same time, the operational benefits of being geographically close remain valuable.

The structure shown in Figure 1 simplifies some of the issues related to IP ownership and use. At the same time, the structure increases the complexity of independent valuation of each instance of IP transfer and use, as discussed later in this paper. Such independent valuation is needed for multiple purposes, including the obligation to adhere to the tax laws of the different countries, and to make appropriate tax payments in each country.

As smaller companies participate in offshoring, and as communications technology makes offshoring attractive for complex projects in large companies, IP is being transferred across borders more often than ever before in history.

Why Assign Value to IP?

The overriding reason for being able to assign a value to corporate intellectual property is the need to understand one's business in quantitative terms and to optimize use and maintenance of IP to the firm's utmost advantage. There are also specific situations where valuations of IP are required. Assigning a value to IP is crucial when setting

prices for IP, when determining royalty rates for shared IP, obtaining financing, or making a contribution to a joint venture. The value of offshored IP is needed to quantify risks because of its availability in locales where legal protection and social structures differ [Sommers, 2008]. If the offshore entity operates at arms-length, then a transfer price must be established as well, since such a transfer is regarded as an export [Rosenberg and McLennan, 2002]. Transfer pricing of tangibles is well established, but transfer of intangibles introduces flexibilities and alternate valuation requirements. Figure 2 indicates the participants, the similarities, and the distinctions when exporting tangible versus intangible property.

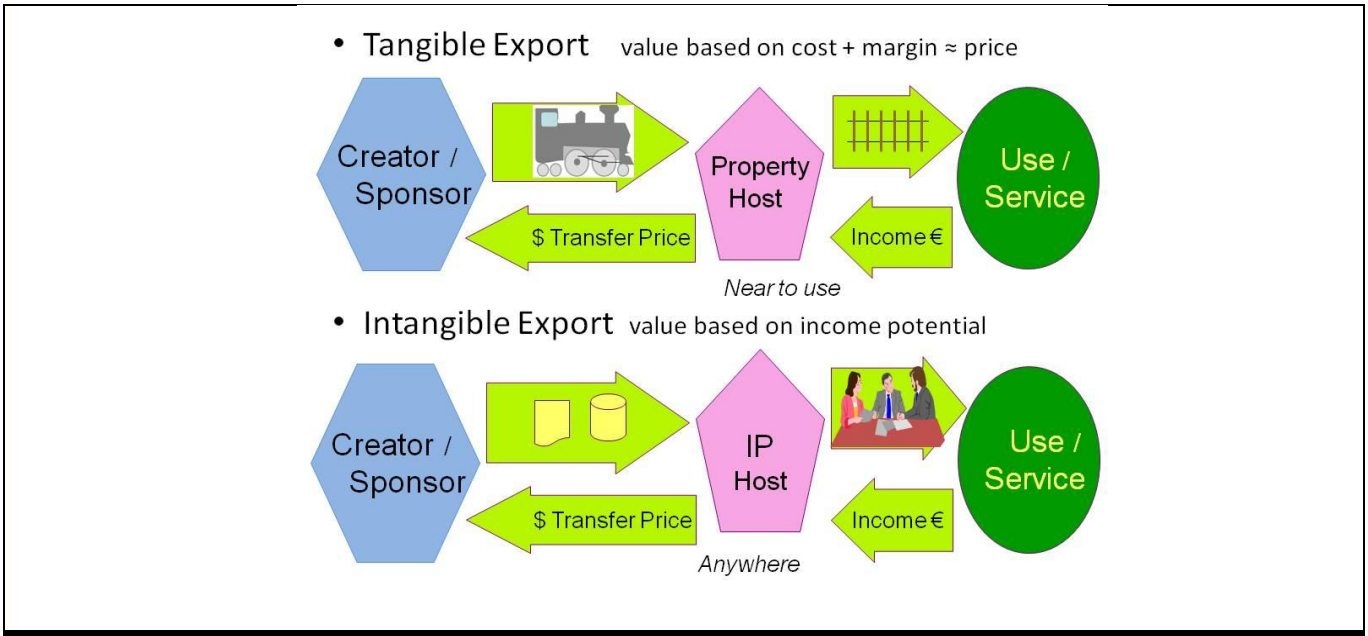

Figure 2. Distinctions when Exporting Tangible versus Intangible Property

Companies are not the only organizations concerned with IP valuation; governments in many countries are losing billions of dollars of taxes due to inadequate transfer pricing estimates in offshore parent-subsidiary relationships [Martinson et al. 1999].

III. THE ROLE OF TECHNOLOGY-BASED IP

For accounting purposes, the Financial Accounting Standards Board defines technology-based IP as patented technology, trade secrets, databases, mask works, software, and unpatented technology. By focusing on technology, we ignore in this paper the value of the reputation of a company, its general trademarks, and the management contribution. These elements are harder to allocate than the technology that is being transferred. We also exclude the value of existing customer loyalty.

The Contribution of Software to IP

Computer software can generate profit by being replicated and sold as products to external parties, and by leveraging internal business processes. Product software comprises operating systems, compilers, database systems, common desktop productivity tools, applications for creative artists, games, and a myriad of other applications. Software used as part of internal Information Technology (IT) can be used to design products, manage inventory and supply chains, handle finances and payroll, support sales and call centers, and provide feedback from the field to correct and improve products [Thornton 2002]. Companies that develop software or products marketed to external customers see the effects of their investment in IP directly, but it is hard to find an enterprise that does not also have some proprietary items of software IP used internally.

Overall, despite massive levels of investment in software and information technology assets, alignment of technology assets with business functions and benefits remains a difficult task [Kohli and Devaraj 2004]. The ubiquitous use of IT and the extent to which it drives the profits of many of today's corporations notwithstanding, the value-generating capabilities of software and other intangibles are easily overlooked, so that attention is focused on expensing and thus minimizing these items [Kwan and Stafford 2007].

Communications of the Association for Information Systems

Without having quantified all of the benefits of internal IT investment, simple measures for making business decisions can become distorted. A reduction of spending on IP investments is easier to assess than the benefits generated by IP investments [Peppard and Daniel 2007]. A reason for this imbalance is that U.S. accounting regulations disallow the capitalization of costs related to internally-developed intangible assets, allowing only for capitalization of certain development costs related to software. The practical effect is that most costs attributable to software to be used in-house can be and are expensed, improving current profits while reducing future assets [Lev 1996]. As indicated later, capitalization in any case does not capture the income potential of effective software.

Even for software to be marketed, capitalization of development costs is allowed only during the period starting when that software is deemed 'technologically feasible' and ending with the release of the new software product to customers. The term "technological feasibility" is ambiguous and depends on management's philosophy and judgment. Therefore, it is relatively easy for maximization of expensing of software development costs to occur, contributing to the inability to view software as a value-creating asset [Mulford and Roberts 2006].

While capitalization makes the costs of software development visible, it does not replace the need for valuation of software IP. Usually, software development costs have no direct relationship to the benefits that the software may create. A company can spend large amounts on, say, administrative software that might seem essential, but will not alter corporate revenues. But a modest project that allows the company to enter new markets can have a major effect on corporate fortunes.

Technology-Based IP in Offshoring

While many types of IP are transferred across country borders in offshoring arrangements, we focus on technology-based IP. Since software is essentially codified knowledge, much technology-based IP falls within the broad definition of software. Offshored software and software-related IP is commonly used in applications such as: call centers, offshored production or operational settings, software maintenance, software adaptation to international standards, software localization to specific languages and regions, software creation, and Web services [Basili 1990].

Examples of software-based IP for immediate use are: user guides; proprietary binary software for use in the host operation, embedded databases, documentation on problem resolution based on prior experience, trademark registration, and patents for embedded concepts. If the software is to be the basis for further development, more material is required: design specifications; source codes; process descriptions guiding further development; and instructions that provide an understanding not obvious from primary documentation. Such documents and computer files that are transmitted under confidence are considered IP. If the host also resells the products in the foreign geographical area, then the rights to use established trademarks, literature that describes the products for the customers, business methods that make sales of the product effective, instructions on exploiting these business methods, and the lists of prior customers and their contracts are all considered to be part of the software IP.

IV. PRINCIPLES OF SOFTWARE VALUATION

Valuation is the process of establishing a fair price for a good or service in the absence of having actual sales data. When tangible goods are transferred to a host for their use, a price for the good is usually already established, giving both parties and regulators guidance about the value of goods being transferred. For software, off-the-shelf marketable packages have similar characteristics. But a master software disk, containing software to be replicated, cannot be valued by a unit price. Its value will largely depend on the future sales of its contents. The contents represent the IP to be valued. The cost of creating the contents, as long as it can be protected, does not determine its value. This observation is applicable to internal use software as well as marketed software products. Consider that a thousand lines of code that generate a report that nobody reads have little value, and a few brilliant lines of code can make a company profitable.

Assigning Value to Software

The importance to the enterprise of valuing its software IP is the same regardless of how the software is created, sold, or used. Valuation issues specific to different categories of software are as follows:

- *Marketed Software*: Intangibles must be valued by their contribution to the future income of a business. More specifically, the value of IP for software being sold is estimated by a forecast of revenue from its future use, minus the cost incurred in providing the software. Software products are easy to reproduce at a cost that is negligible. Its distribution is relatively simple and can occur over the Internet too. Even at a competitive price, each incremental sale garners much more profit than the incremental cost of production. If a product has a marketing history, its ongoing sales in a foreign region can be estimated.

- *Embedded Software*: Low replication costs also apply to the software that is embedded in so many of seemingly tangible products, from mobile phones to aircrafts. The allocation of income to software versus the remaining product IP is a difficult issue. Some of the metrics we use fail to capture the IP of embedded software adequately. Although the potential value of embedded software in the global market is great, and off-shoring is common, we will not try to analyze this market segment now.

- *Internal Use Software*: Many businesses depend on internally generated software that is created in-house or made to order by a vendor. The value of IP cannot be based upon its development cost. The income from business operations now has to be allocated to the software versus other costs of doing business. Due to the ubiquitous effect of software on the supporting processes of a company, it is appropriate to take a global approach. Contributions to income also derive from investments in creative people and machinery. In such a joint contribution scenario, income attributable to software can be fairly assigned based on the assumption that the management of a company is rational in the allocation of its resources [Samuelson 1983]. If such optimality is assumed, corporate net income created by diverse expenses can be allocated according to the proportion of the costs incurred. Since the fraction spent on software from year to year will vary, the allocation of income should be made on the basis of long-term expense ratios, in order to even out variations over the life of the software.

- *A Common Key Attribute*: All types of software present the same unique problem in valuation; that is, that in order to ensure continued usefulness and applicability, software must be periodically updated so that it remains current. Maintenance costs comprise between 60 and 80 percent of software R&D expenses in mature companies, amounting to approximately 15 percent of the prior development and maintenance costs [Glass 2003]. The effect is that software is *slithery*; that is, it is always evolving via maintenance efforts.

The purchaser of software will only be indirectly aware of the changes that software undergoes; however, most purchasers understand that, unless they have a maintenance contract, they will have to buy a new version of the software every three to five years, since the previous version will become obsolete. Such obsolescence comes about not because the installed software has changed, but because related technology and performance expectations change. Much of the software must be updated when business rules, accounting standards, and taxation methods change. With the changes in code come requirements for documentation updates. Note that new editions of technical books exhibit a similar renewal cost.

The flexibility that software brings to systems has its own costs. Valuation approaches to be employed must be able to deal with the slithery software. Multiple IP valuation methods have been proposed by researchers. Of the methods shortlisted below, one or more may be appropriate for a given situation, and the choice is made based on the facts and circumstances applicable to the particular case.

Alternative Methods of Software Valuation

Direct Assessment of Future Income The determination of future income requires estimating the income accruing to the IP in each of all future years over its useful life, i.e., the amount sold and the net income per unit after routine sales and distribution costs are deducted. If the IP is used internally, then the savings accrued by owning the IP can be similarly estimated.

The estimation of the IP value of marketed software requires estimates of sales volumes over its life; estimates at the unit product level, as the sale price, sales and distribution overhead; and estimates that pertain to the product line, such as marketing costs, likely frequency of future versions, and maintenance cost expectations over the life of the software. These estimates can be based on prior experience with the product, or on experience gained with similar products. When offshoring operations of an existing or similar product, prior data will be available and estimates will be reliable. Published information to complement internal experience is sparse, although sales trends of competitive products may be found in competitors' documentation and stockholder reports, and in research reports of industry analysts.

The unit price for successful software products tends to be stable, even when later versions have more features. Data on sales volume expectations of consumer products can be modeled using Erlang distributions [Chatfield and Goodhardt 1973]. The sales curve in the sample graph of Figure 3 represents an Erlang parameter of 12, appropriate for products that take some time to penetrate the marketplace. Smaller Erlang parameters describe more rapid product acceptances. An appropriate Erlang parameter can be computed based on sales experience with similar products, or estimated given data on initial sales behavior and an estimate of product lifetime.

When software is made available with maintenance contracts, a second income stream exists, also shown in Figure 3. The quantity of products under maintenance increases over the product life, contributing steady income. Such maintenance income can exceed sales income over time [Cusumano 2004].

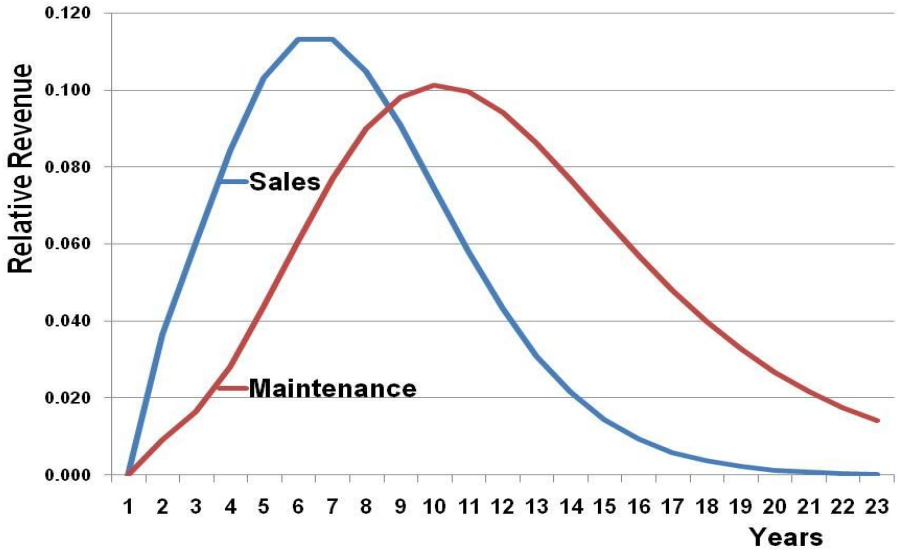

Figure 3. Income Streams for a Software Company that Charges Maintenance Fees

Software that is sold as shrink-wrapped products is also maintained, but the periodic issuance of versions superimposes a periodic jiggle on the sales curve. Figure 4 sketches the shape of such a jiggle, assuming a two-year version release interval. Once an estimator is aware of such a behavior, a long-term revenue pattern can be generated.

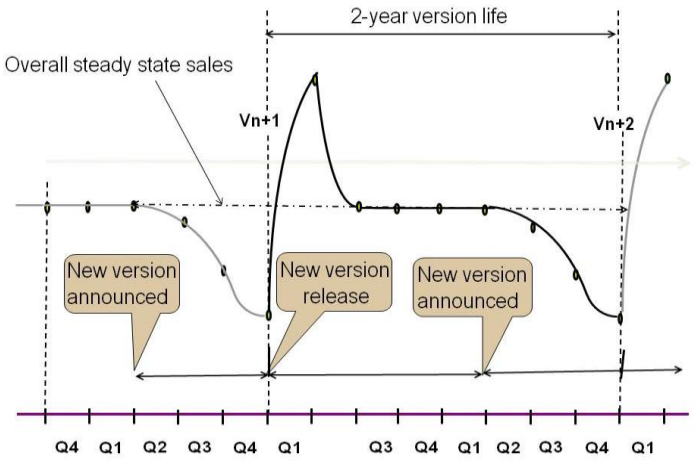

Figure 4. Effect on Sales due to Version Releases

The future revenue profile of truly novel software is uncertain and hard to quantify, but it is still important to make the estimates needed for a valuation [Laurie 2004]. If expectations are not met, a business can make adjustments to prices and investments. Without documented expectations, delays in recognizing problems will be common and necessary business decisions will be delayed.

The other parameters needed to complete an income estimate are not very product specific, and can be estimated based on corporate or related business experience. Sales and distribution costs for software, since it has negligible production costs, can easily take 50 percent of revenue, as seen in relevant corporate financial statements. Version frequencies must balance keeping the software product up to date while not annoying customers excessively. Maintenance costs were addressed earlier, and are based on the prior software investment, while maintenance revenues, also often 15 percent, but of the original sales price, apply to all software units that are under maintenance contracts [Sneed 2004].

Research and Development (R&D) Spill-Over This valuation method computes the expected income by relying on the leverage of R&D expenses, aggregated over multiple years. The method employs three key parameters: annual investments in R&D, the period that such an investment will contribute to future income, and the leverage ratio of R&D investments on future corporate income. Published economic benefits of R&D investments vary greatly, so that assigning such a ratio to specific R&D induces significant uncertainty [Leonard and Stiroh 2005]. Determining the start and end of life of R&D benefits is also difficult. Early, high risk R&D investments should have a longer life than investments in short-range product alterations. R&D life values of about seven years have been cited, but these are based on an unanalyzed mix of R&D activities [Grilliches 1984]. The R&D spillover approach is also hindered because U.S. accounting practice causes software development and maintenance costs to be lumped together as R&D costs [Lev 2001]. Unless the R&D components are broken down, a valuation based on R&D spillover method is unreliable for specific software under development. For established companies, where maintenance is the major component and profit margins are stable, R&D spillover can provide useful guidance.

Real Options (RO) Valuation For software and other intangibles that have future income generating ability and are currently yielding zero or negative returns, real options (RO) valuation is an alternative. Based on the Black-Sholes stock option valuation methodology, RO views investment in IP as an option to develop the current asset depending on the facts and circumstances at option dates. Dates to be considered would be key development, product release, and profitability milestones. This method still requires an income-based valuation, but adds the optional value of flexibility in spending or cancelling R&D costs associated with development [Dahlgren 2006]. A drawback is the myriad of variables inherent in options pricing, leading to heightened risk of improper valuation and pricing audits, especially for options not in the public view and marketplace [Damodaran 2006a]. The relative value of options in the overall financial picture of a corporation is hard to assess in a company with a mix of activities. Divulging specific information to outsiders regarding optional plans for future expansion or cancellation of projects is very unattractive to management [Damodaran 2006b]. RO-based valuations are hence mainly restricted to analyses performed internally or by informed and trusted experts.

Market Capitalization Subtracting a company's book value from its total market capitalization gives a "market worth" of the company's intangible assets based on the stockholders assessment of future income. Such an estimate is already discounted for perceived risks. The value of intangibles that are not related to software must be subtracted as well: management expertise, the value of the workforce that cannot be protected by non-disclosure arrangements, and corporate trademarks that are not related to software.

The portion of the market value allocable to software can be substantial; for a software manufacturer, this portion obviously dominates. Consider the hypothetical case of a logistics company if all proprietary internal use software for scheduling and customer interaction were to disappear. The company would be out of business. Similar scenarios can be drawn for most modern businesses. For a diversified company where the marketed software to be valued is only a part of the companies' products, a further allocation must be made. A split by sales volume becomes invalid when the products being assessed differ substantially in type and market from the items being excluded from the transfer.

This top-down approach implies that shareholders have more wisdom relevant to future income than analysts who aggregate corporate IP values bottom up. To what extent internals primarily known to management are valued by stock analysts and shareholders is uncertain [Quick et al. 2005].

Combining Valuations If several methods produce similar results, then the valuation carries more respect. An estimation of R&D spill-over can complement a valuation based on an estimation of future income. Essentially, R&D spill-over measures the input to the IP generation process, and income-based methods estimate the results. Market-based valuations include common perceived risks, but not opportunities or risks undisclosed by corporate

management. Option recognition can help when assessing differences between income-based methods and market based valuations.

The options approach can also be used to assess the value of opportunities and risks engendered by expanded offshoring arrangements, which are likely beyond expectations used in other valuation methods. There is an option value associated with maintenance expenses, since costly renewal of IP can be reduced when expectations of software lifetime are threatened by external factors, as the availability of new computational paradigms or competing products.

In addition to the methods listed, segments of IT-based IP can be measured in terms of specific objectives, as "for efficiency" or "for knowledge management," each of which has different payoffs and thus suggests the use of different valuation techniques [Kwon and Watts 2006].

Estimating Life of Software

All software valuation methods depend critically on the expected life of software. Software is maintained throughout its life. The effect of ongoing maintenance is that software can have a very long life, much longer than the equipment used to execute the software. In that sense, software life is similar to that of a trademark, which can be maintained indefinitely, until its renewal no longer makes sense because of external business conditions [Smith and Parr 2005]. A corollary effect of that maintenance is that the software changes greatly over that long life, so that the product being valued at one time differs greatly from the product at a later time. The improvements of contents must be reflected when applying valuation models [Wiederhold 2006].

Limits to software life can be external or internal. External factors are competition, often enabled by not maintaining the software adequately, and obsolescence due to new business concepts. A current example is the move to Web services from client-server models. The sales lifetime of the client-server concept, initiated around 1985, has already exceeded the 16-year average value for software used in Figure 3, but given the rate of replacement, client-server software will continue to create income for many years to come [Kelly 2006].

The ever-increasing maintenance costs of software impose an internal limit on software life. When the cost of maintenance exceeds the income attributable to the software, the effective life of software, as well as its contribution to IP value, ends [Spolsky 2004].

Over a software life of about 16 years, there may be eight significant version releases, more initially, fewer later in its life. Software that has significant dependencies to external conditions, such as regulations of the Securities and Exchange Commission and the Internal Revenue Service, will require more frequent updates.

Discounting Future Income For valuation, all forecasts are discounted to their respective net present values. Such discounting lessens the effect of errors of estimating life and life-time income. Less-mature products will be subject to a higher discount rate than products or internal use software that is well established. Mature software will have less risk associated with offshoring as it will be time-tested and all its teething problems resolved; accordingly, these risks will be reflected in a lower cost of funds needed by the host for obtaining the IP rights. Risks are still present, however. Discount rates for software investments vary widely in the range of 10 to 25 percent, but can be narrowed for a specific sponsor, product, and IP host [Jeffery 2004].

Software IP in Offshoring

When considering the offshoring of software IP, we must determine the valuation of the software at the time of transfer and the value contributed subsequently by maintenance. To simplify the discussion, we consider here unit product costs and revenues, ignoring sales volume variation. As observed earlier, the price of a unit of well-maintained software tends to be stable through most of its life. A steady rate of maintenance will diminish the relative contribution of the prior IP, transferred when the offshoring arrangement commenced, versus the ongoing contributions of IP, both shown in Figure 5. One approach to measuring the relative contributions is by their cost relationship. After several years the aggregated maintenance costs have become equal to the original cost of development, so that relative contribution of the original IP has been diminished to 50 percent, as shown in Figure 5.

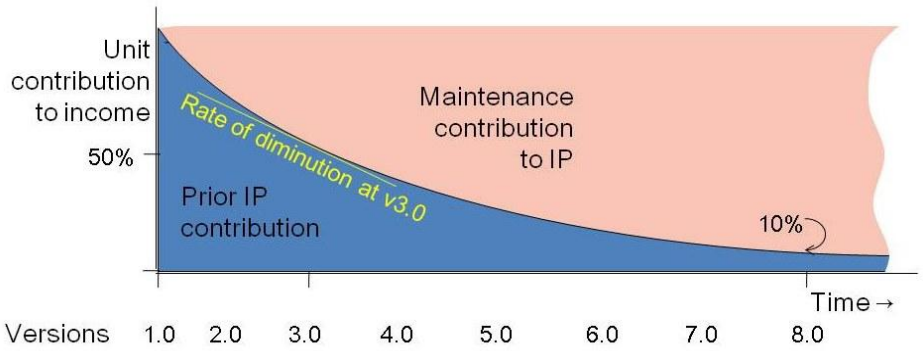

Figure 5. Diminution of the Value of the Original IP Contribution in Software

While the software in total has an indefinite life, the contribution of the original transferred software reduces steadily. For estimating value of the IP of transferred software, it is appropriate to impose a limit. A practical limit to life of the transferred software IP is set when the original contribution becomes less than 10 percent, also indicated in Figure 5 [Wiederhold 2006].

Measuring Diminution Software maintenance can be measured in several ways. One metric is the relative investment input to development and maintenance, discounted up or down to the date of the IP transfer, as well as projected subsequent maintenance costs. As already noted for the R&D spill over method, often the historical costs are not well documented and cannot be effectively allocated to a specific software project [Mulford and Roberts 2006]. An alternative metric is to consider the output in terms of the volume of code that has been generated. Early investments are valued highly, both from an intellectual point-of-view and from the financial view as having had a long and risky investment lag. The alternative metric of well-documented, functional metric of lines-of-code (LoC), is the simplest and easiest to use. [Jones 1998]. Old code provided the essential functionality for initial purchasers, but also becomes well known and easily replicated; new code adds new value and keeps competitors at bay.

A transfer of mature software, say the third version release, will experience a lower rate of future diminution than the initial release of the software, as sketched in Figure 5. But now the initial contribution includes the maintenance effort up to that Version 3, and will be included in the initial contribution when computing relative contribution due to subsequent maintenance efforts. The transfer of mature software is actually typical for offshoring initiatives, since during initial development software creators traditional give little thought to outsourcing or offshoring possibilities. Only when software is successful and call center and maintenance demands subsequently grow, that outsourcing is considered.

Recently, concurrent development of original software using globally distributed teams has become popular [Gupta and Seshasai 2007]. Then the initial contribution will be absent or small, and all or most of the generation of IP is due to joint ongoing efforts. The use of a host company to hold all the IP being generated, pay for all efforts, and collect the benefits from that IP can simplify the task of keeping track of IP in such arrangements.

V. ALTERNATIVE OFFSHORE HOSTING ARRANGEMENTS

When a sponsor company outsources work to a service organization, the user requires access to IP from the sponsor, in essence becoming a *consumer* of IP. If a user only consumes IP, then a licensing arrangement is appropriate. IP licensing activity has grown significantly in recent years. In 2004, licensing receipts for patents alone totaled $110 billion, up from just $10 billion in 1984 [Arora 2005]. While licensing is an important profit-making activity for the technology industry, the remainder of the paper focuses on offshoring transactions that require the foreign organization to gain more comprehensive access to the sponsor's IP, in order to become a contributor to that IP.

As indicated in the introduction, three distinct approaches to obtaining offshored services are common. In this section, we will also introduce a fourth entity, a Controlled Foreign Holding company. This last type of organization does not host actual IP assets but instead owns the rights to the IP, acting as an intermediate entity between the

sponsor and sponsor-controlled IP hosts. These organizational distinctions are important from the viewpoint of protection of intellectual property, and are summarized in Table 1.

Table 1. Four Organizational Approaches to Obtaining Offshore Services

Alternative Organizational Structures	Description	Opportunities for Sponsor	Drawbacks for Sponsor
Corporate Offshore Operation	All IP, control, and financial reporting integrated with sponsor company	Lower labor costs than in home country; no transfer pricing issues, since this is not an arm's-length relationship	Higher communication and management costs; local laws may constrain ownership or activities
Independent Foreign Company (IFC)	Independent organization under contract with multiple sponsors	Avoids costs and complexity of setting up an offshore operation	Difficulties in sequestering and safeguarding sponsor IP
Controlled Foreign Corporation (CFC)	Captive organization of sponsor	Stronger operational and IP control than with IFC; easier sharing of IP than with IFC	High initial capital requirements and other set up costs; complex administration
Controlled Foreign Holding Company (CFH)	Distinct captive entity often located in a tax haven country; formal owner of IP, receives royalties and allocates reimbursements for IP generation and profit distribution	Opportunities for income tax avoidance in the sponsor and the host countries; flexibility in employing IP assets internationally	Significant set up costs and complex administration, often delegated to consulting firms

Foreign Unit Established under the Corporate Umbrella

Corporate Offshore Operation The establishment of an offshore operation can provide benefits in terms of labor costs to a corporation, adding some communication and management costs. In terms of exposure of IP, the situation differs little from domestic outsourcing. Local laws and conventions must be adhered to, and some constraints on ownership may apply. Such an organization does not operate at "arms-length," and the valuation issues associated with transfer pricing do not arise. We will not discuss this alternative further in this paper.

Operations Contracted to an Independent Foreign Company

Services Contracts To avoid the costs and complexities of running an offshore operation, it can be advantageous to contract for the needed services with an existing foreign company. In this arrangement, no transfer of owned IP needs to be made, but access to needed IP must be granted. The sponsor company will pay the unrelated foreign organizations for the IP-generating efforts they provide. In 2005, the overall international trade balance of IP licensing transactions between sponsors and independent foreign companies accounted for more than 40 percent of all international transactions between unrelated companies, double the extent of just five years prior [Kamiyama et al. 2006].

Licensing and Royalty Agreements If the independent foreign company also markets products or services to others based on the sponsor's IP, then more complex licensing agreements can be used. Royalty payments or a commission in connection with sales or services are paid for income-producing use of that IP. This alternative is shown as the choice at the top of Figure 6. Royalty rates should match expected income flow from each item of IP being offshored. Royalties consist of payment for IP use and for in-house maintenance costs; product improvements are made at no extra charge. Usually, software is maintained at the parent company site; however, costs for any offshore maintenance work can be reimbursed by the sponsor, which has the effect of keeping the IP wholly owned by the parent. The structure of offshoring contracts, however, has an effect on the amount of rework needed within

the development cycle; this can add to or detract from future software maintenance needs: for example, fixed fee contracts tend to result in less rework [Gopal et al. 2002].

Formal Transfers of IP If the IP needed at the Independent Foreign Company (IFC) is substantial, a formal transfer of IP becomes desirable. The IFC then becomes a host for that IP, or for a share of that IP. Costs for maintaining that IP are paid locally, and benefits for the use of that IP accrue locally as well. Motivations to host IP at the IFC include intellectual participation and the interest of the sponsor company in sheltering of foreign income from taxation by not transmitting that income to itself. This alternative is presented as the choice at the bottom of Figure 6.

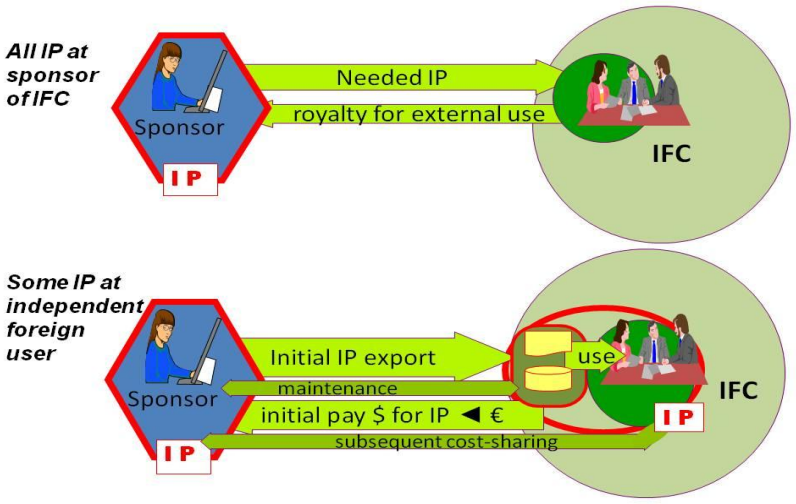

Figure 6. Two Alternative IP Locations for IFC Use of IP

When outsourcing work to independent foreign companies, the choices of how to structure IP transfers, transactions, and remunerations must be set contractually [Ranganathan and Balaji 2007]. In particular, sponsors and service providers should "make intellectual property issues transparent at the contract stage, and arrive at precise agreements about what is and is not allowable, at what price, and what penalties arise from non-compliance with agreements or misappropriation of knowledge" [Oshri et al. 2007]. Recent literature has focused on optimal structures of contracts between sponsors and service providers; for example, time-and-materials contracts, while not efficient when considering the information known during the contract structure phase of development, tend to bring in higher revenues for vendors rather than their sponsors [Gopal et al. 2003].

Risks to IP An Independent Foreign Company (IFC) serving multiple sponsors must sequester each sponsor's IP carefully to avoid risks of loss due to inadvertent intermingling of IP. Many IFCs pride themselves on the secure manner with which they protect the owners' intellectual property, but IP providers still have some reasons to be concerned. The employees of an IFC are likely to work on more than one contract, though not concurrently. The loyalty of employees of an IFC will be primarily to their employer, rather than to the owners of the intellectual property. Even when documents are protected, it may be difficult to protect the underlying concepts. The situation is similar to large multinational consulting companies that work for multiple competing clients, and must strive to avoid client-confidential information being inadvertently shared among their employees working on projects sponsored by different clients. Software development methods are also difficult to sequester strictly in an IFC host setting, though a number of vendors claim that they have developed approaches to achieve such isolation. Conversely, because of its familiarity with local conditions, an IFC may offer lower costs than other scenarios.

Sponsor Controlled Foreign Corporation

When the operations to be offshored are major, the preferred approach is to set up a captive entity to provide the services. The captive is established as a foreign subsidiary in which the sponsor has a majority stake, a Controlled Foreign Corporation (CFC). While CFCs are subject to local laws and standards, the control provided by ownership and authority over a CFC's operations is stronger than the contractual strictures that govern an IFC relationship.

Employees at a controlled foreign corporation work within the sponsor's umbrella. All employees of the CFC have access to the sponsor's IP and can get assistance, when needed, from fellow staff members in other countries. CFCs can provide complementary benefits to a parent company; a CFC can function as a marketing and sales center for particular geographic and language areas; it can garner feedback from local constituents; and it can adapt products and marketing techniques to local conventions.

The Controlled Foreign Corporation (CFC) option does involve a substantial initial capital requirement, and adds to the complexity of administration. In contrast to a simple corporate offshore operation, CFCs must keep their own books, and transfer costs or profits as stipulated by legal conventions and contracts. Once a CFC is established, however, sharing of IP becomes easier. When providing IP from a generating sponsor to a consuming CFC, three alternatives are possible, as shown in Figure 7.

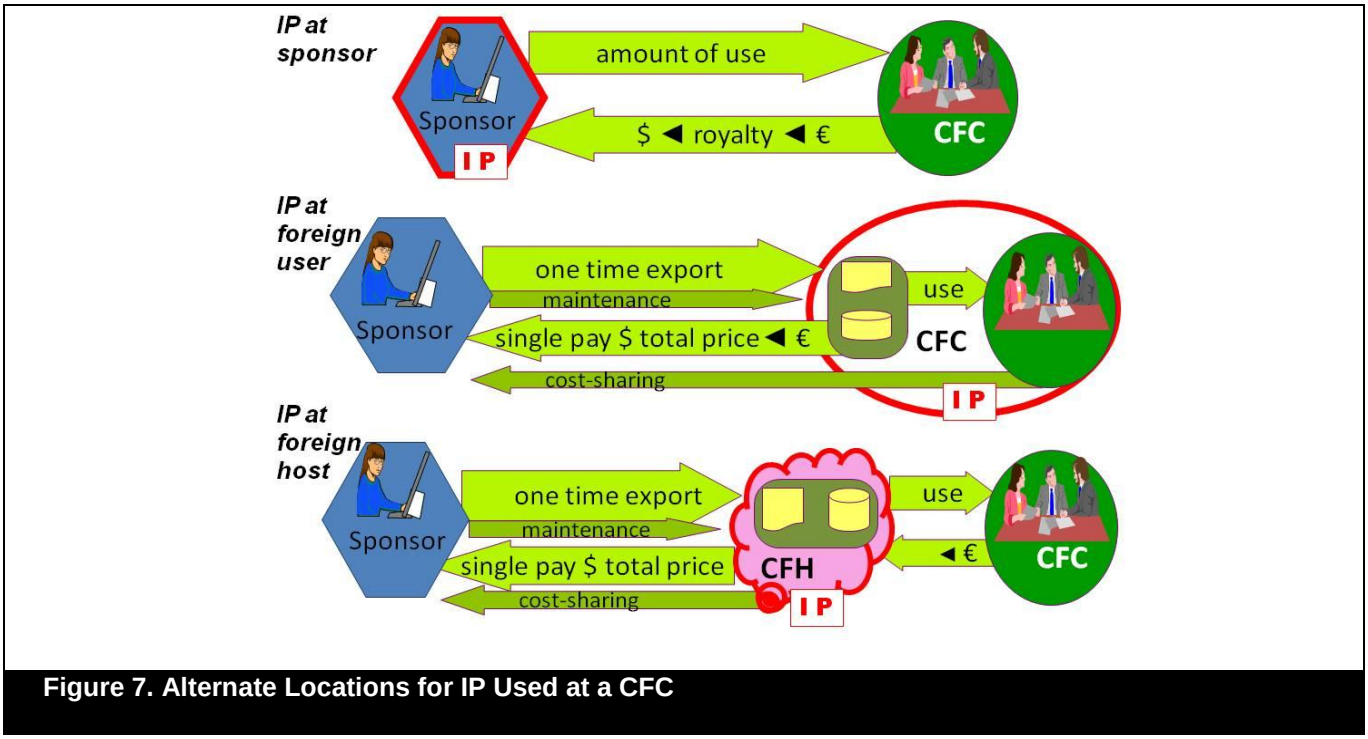

Figure 7. Alternate Locations for IP Used at a CFC

In the first alternative, the formal ownership of the IP remains at the sponsor and remuneration for use is in the form of royalties or commissions. The second alternative structure is an investment by the CFC in importing and hosting the required software IP, as shown in the middle diagram of Figure 7. The CFC pays the transfer price for the imported IP. The fraction of IP to be transferred from the sponsor to the CFC can be based the relative percentage of foreign sales. As an example: if 25 percent of the owner's products are sold via the CFC, the fraction to be transferred is 25 percent of the total relevant IP involved in these sales efforts. This fraction does not split the IP; it is just a contractual allocation. Subsequently, maintenance costs for the IP will be cost shared between the CFC and the sponsor in the same ratio. If the CFC participates in maintaining the software, the CFC will receive reimbursement from the cost-sharing payments received by the sponsor.

Non-operational IP Holdings in a Controlled Foreign Holding Company

The third alternative in Figure 7 introduces a Controlled Foreign Holding (CFH) company, also owned by the sponsor. Now IP generation and consumption involves three parties: the sponsor company, its Controlled Foreign Corporation (CFC), and the CFH. The fraction of the sponsor's IP needed by the CFC will be transferred to the CFH, and the CFH will start out being indebted to the sponsor for the value of that IP. The end-consumer of the IP—the CFC—now pays its royalties to the interposed CFH. The CFH will reimburse the maintenance costs incurred at the sponsor or the CFC, and can then repatriate profits and losses to the sponsor. Profits not needed for the sponsors operation can be accumulated at the CFH, initially reducing the indebtedness, and subsequently be held for new initiatives. In this structure, a CFH is often strategically placed in a low- or no-tax locale, reducing the tax burden for the sponsor. If the CFH requires high royalty rates from the CFC, the profitability of the CFC will be reduced. Now income taxes paid to the country where the CFC is located will be low. The combined effect is that taxes commensurate with IP contributions will not be paid to the authorities in countries of either the parent company or the CFC. The overall profitability for the consolidated entity will be enhanced.

Additional costs are associated with setting up and maintaining a Controlled Foreign Holding company (CFH). The CFH option is hence mainly available to large enterprises. Financial service companies can minimize the costs of maintaining a CFH by sharing managed foreign facilities with many sponsors. The existence of a CFH is hard to observe. Corporate IP assets are well-nigh invisible in publicly available accounts, following GAAP rules. But even the resulting financial assets are not shown, since U.S. law allows corporate accounts in foreign holding companies to be aggregated into consolidated accounts of the parent, helping to "reduce corporate paperwork." Only the names and location of such foreign holding companies are shown. Hence, stockholders and external business experts are not given a breakdown about the location of the actual assets of the company. Most knowledgeable about the existence and scope of CFHs are the advising companies that set up the procedures and even manage the CFHs for their clients.

Choice of Organizational Models in Practice

The organizational models currently favored for different types of activities, along with associated valuation issues, are summarized in Table 2. This table largely ignores the effects of having an intermediate holding company, a CFH.

Table 2. Four Organizational Approaches to Obtaining Offshore Services

Scenario	Description	Valuation Issues	Related Issues
Call Center	Reduction of service costs; encourage further purchases; gather feedback	Initial support software and response methods transfer; subsequent sales generate IP; maintenance costs	Both IFC and CFC models are in wide use.
Software Localization	Localization to particular geographic area of pre-existing software for sales	Value added in localization process; subsequent marketing includes incremental IP	Both IFC and CFC models are in wide use.
Software Maintenance	Maintenance done in low-cost area to increase competitiveness; free up in-house designers to create novel software; income from maintenance licenses can eventually exceed the income from sales.	Essentially all IP related to software must be transferred; high risk if IP transfer is less than perfect; trademarks, marketing know-how kept in sponsor country; IP added in maintenance is often paid by sponsor, to keep ownership as well.	Establishing a CFC is preferred as it is hard to partition all needed IP effectively.
New Software Creation	Simpler than subsequent localization; requirements for new software are much easier to circumscribe and hence IP valuation is easier.	New IP is created and attributable to the foreign corporation if it pays for it; trademarks and potential market knowledge IP should be shared.	If software is novel and promising, CFC is preferred.
Shared Software Development	New phenomenon in which software is developed concurrently across borders or with the passage of the sun [Gupta 2008]; new paradigms such as the 24-hour knowledge factory emerge [Gupta 2009].	IP imported, leveraged, and exported daily; no preexisting framework for valuation; equivalence and metrics of work performed questions; varying levels of IP can be transferred; new transfer pricing rules are ambiguous.	Having a CFH can centralize ownership.
Web Services	Functionality of software provided over the Internet to the users who require it; income generating operations moved to partner; provides a means to protect the software itself	All the owners' intellectual property is transferred, and generates income at the host site; call center, maintenance, localization, marketing and sales are performed at the host	Having a CFC is preferable for accounting reasons.

VI. CONSIDERATIONS AND MOTIVATIONS

We have described the many alternatives for managing software and related IP when offshoring operations. We can now revisit the questions raised initially: *Why should companies make the effort to assess the value of the IP embedded in their software?* While the motivations we sketch below are relevant to all knowledge-intensive companies, they take on particular importance when considered in the context of transferring IP offshore.

Accounting and Finance Considerations

Understanding Contributions to Market Value Consider a software company whose essential value depends on the IP incorporated in its products. Its market capitalization—the number of shares outstanding multiplied by the prevailing value of each share held by the public—is an external estimate of its total corporate value. But market capitalization tends to fluctuate. Relying on book values is clearly inadequate. For businesses operating in knowledge-intensive industries, intangibles can account for most of their assets: even more than 97 percent of all assets [Laurie 2004]. In a 1997 market study, Coopers and Lybrand reported that, for all public companies put together, intangibles amounted to more than two-thirds of their then $7 trillion collective market value [Parr 2002].

Knowing the value of the income-producing components of its business helps management to understand what it can control: its products, the marketing of its products, and allied items versus the elements outside of its control: the market itself and perceptions about the position of the company in the market. This reasoning also holds true for companies in other economic sectors, from finance to manufacturing. Most modern businesses depend to some extent on information technology (IT) for generation of revenue. Determining if the contribution provided by IT and the software used internally is substantial or not will allow setting of focus. An informed manager and investor can better drive overall stock price valuation [Thornton 2002]. When substantial investments in IT are needed, management may have to bring the evidence to its board of directors, since few board members will be knowledgeable outside of the company's apparent primary product line or finances. Having a consistent approach to quantifying the impact of technology IP on market value also provides a useful tool for measuring management performance.

Valuation for Transactions Most major transactions, such as acquisitions, long-term supplier or distributor contracts, and outsourcing, involve IP. Establishing a purchase price, royalty rate, or transfer price is best done on a consistent basis, rather than on a case by case assessment, often provided by outside advisors who have unknown experiences and prejudices. Similarly, when seeking financing, a solvency opinion may be required, to assure that debts will not be excessive.

The quantification of IP value protected by copyright, patenting, and trade secrets is essential when pursuing infringements or contract breach damages. Offshoring adds a new dimension, as it can make recovery more difficult.

Contractual Considerations and IP Risk in Offshoring Transactions

Allocating Income The value of the IP is affected by the structure of offshoring contracts and the location to which the IP is bound. The income from royalty rates should reflect the value of use of the IP in the geographic region covered by an independent foreign company or controlled foreign corporation. The use of IP can be split according to marketing domains. The allocation of partitioned IP is generally determined when it is used to generate income [Smith and Parr 2000].

Since IP is also generated by brand and product marketing, allocations become complex when income attributed to IP is contributed by multiple sources. Sponsors and their controlled foreign corporations will likely invest in different marketing methods. These contributions can have life spans that are different from their technological components.

IP embedded in the software code rarely stands alone. With an offshore transfer, related IP is transferred as well. Important are the documents and plans that explain the software, as well as documents and trademarks that help market the software. Trademarks associated with the software are often broad, and not specific to a service or product being valued. Allocating income across product lines for distinct components of IP is complex and involves significant subjectivity [Damodaran 2006a].

Contract structuring in offshoring arrangements involving software IP requires an understanding of software maintenance that is not covered in legal references. Often physical property rights are inappropriately applied to software, leading to inefficient contracts being drafted [Walden 2005]. Ongoing responsibilities to keep the software fit for commercial use are more onerous than seen in the case of physical property.

Risk of IP Loss Understanding the impact of IP loss on future earnings is key. The mechanisms vary, and much public emphasis is on patented IP. Risks for IP protected as trade secrets include delivery of copies of source code

or plans for further development to competitors. Software used for help desks contains advice and reveals weaknesses that competitors may exploit. Decision support programs often have valuable historical and economic tables embedded in those programs, and such data are especially vulnerable.

Data to be protected for privacy reasons are also at risk, but here the liability is not based on its value. IP covered by patents and copyright is at risk in countries where protection is weak, but that issue is not specific to offshoring, since the material in patents and copyrights is already public.

The types and extent of risks vary greatly, and cannot be enumerated or rated here. It is unclear if alternate contractual arrangements or IP hosting schemes make a difference, since the FBI estimated in 1998 that 80 percent of all electronic design theft is attributable to sources inside the company that created the IP [Mackintosh et al. 2000]. In practice, the cost of protection and the cost associated with IP loss must be balanced [Gates 2004]. When asked to list reasons for opting to forego outsourcing arrangements, nearly 60 percent of the companies included concern for IP issues in their respective lists; half of the companies stated that greater assurance of IP security would fundamentally alter their decision [Studt 2007].

Tax Considerations

Transfer Pricing Governments have an interest in properly valuing exports and imports since they contribute to taxable income and expense offsets. U.S. Treasury regulations stipulate that divisions of an enterprise operating as distinct entities must deal with each other "at arm's length;" i.e., that assets being bought and sold between controlled divisions must be priced at prevailing market rates. Similar regulations exist in most jurisdictions, leading to proper taxes being levied where the products were produced and where they are marked up for sale.

The income from the export of intellectual property (IP) to foreign entities operating nominally at arms length should be treated similarly to income from any export, but recognition of the export of IP remains problematical. If the host receiving the IP is a controlled foreign corporation of the sponsor or a controlled foreign holding company, then the transfer of IP is not transparent on the sponsor's books, since the books need only show consolidated amounts [GOA 1995]. The extraction of profits from sponsors and sellers via royalties using complex IP hosting structures is common [Martinson et al. 1999]. The amounts involved in these arrangements are massive [Economist 2000]. Developing countries are commonly deprived of tax income that could be utilized to grow their respective infrastructures [OECD 1998].

The onus for a reliable valuation is on the taxpayer who transfers the IP, just as it is for tangible properties. The concept of an "arm's-length standard" is to allay any suspicion that minimization of taxes plays a role in the valuations. For taxpayers and for the governments, the lack of standardized and reliable IP valuation techniques has hindered assessment of taxation effects when considering offshoring costs.

Actions of Taxing Authorities Some countries are stepping up to combat this problem [Ihlwan 2006]. EU countries are implementing more stringent transfer pricing documentation requirements. Additionally, many countries (such as Brazil) are beginning to impose special taxes on service or IP importation, and these must be taken into account when making strategic decisions related to offshoring of IT tasks [Bierce 2006]. Finally, new U.S. Treasury transfer pricing regulations (see: IRC §§ 1.482-1T(d), 1.482-4T(f), 1.482-8T) promote the use of profit-based transfer pricing methodologies that allocate income in a manner corresponding with the economic value added, a more useful approach than market and cost-based methods. Pricing audits, based on the approval of new U.S. Treasury transfer pricing regulations for services and IP, oblige business decision makers to properly value IP [Carson 2008].

VII. CONCLUSION

Since intangibles drive the profitability of many modern enterprises, consistent Intellectual Property (IP) valuation is a critical issue for businesses. Internet and communications technologies allow financial and intellectual property to be transferred rapidly and invisibly. This flexibility facilitates commerce, but also means that businesses face greater challenges in controlling the flow of their IP assets. The strategic exploitation of IP is vital to sustainable profitability, and is important in order to comply with regulations that continue to grow in complexity.

This need for IP to be properly quantified is exacerbated in offshoring arrangements. As offshoring becomes more widespread, benefits and costs must be understood and balanced. While transfer of jobs has a high emotional interest and visibility, the long-term effects of intellectual capital transfer may be of greater importance. The alternatives of contractual and hosting arrangements available for cross-border outsourcing arrangements can be better assessed if their respective values can be properly analyzed.

The transfer of both monetary and intellectual capital must be considered when establishing a proprietary Controlled Foreign Corporation (CFC) because failing to value IP in this scenario can lead to improper estimation of costs and risks. Valuation is also needed to assess:

- The alternatives of imposing royalties versus initiating an IP transfer
- The extent of the risks associated with offshoring arrangements
- Tax consequences of entering into offshoring arrangements

The process of assigning values to software and related IP is done internally by companies in cases where they decide to establish a Controlled Foreign Holding (CFH) entity. This entity is typically setup in a tax haven country; otherwise, the corporate tax benefits would not be obtained. The process of assigning ownership rights, amounts, royalty rates, allocations, and IP values is generally not made public.

IP valuation requires projection into the future, and hence can never be certain. But that is what planners in business settings have to deal with. So valuation should be done as well as it can be done. By analyzing the role and capabilities of the four distinct valuation methods in this article, the uncertainty can be circumscribed and discussed.

Software is slithery, a continually evolving artifact; its maintenance is recognized by software engineering experts, but ignored by educators [Wiederhold 2006]. Within a company, both the incremental investment inputs and the code outputs of maintenance can be evaluated. The quality of the data will depend on the maturity of the software. Projections into the future will still be required, in order to analyze all alternatives in an equitable manner.

The goal of this paper was to describe in an organized way the importance of IP valuation in offshoring arrangements. The difficulties in assessing IP value are such that attempts to do so may seem incidental to the project at hand, and are easily lost in a focus on myriad other factors. But, it is within these offshoring arrangements where IP valuation is most important. The valuation of software is not easy, and requires many assumptions. But it can be done. The cost-benefit and risk analyses required for offshoring software use and software development depend on such valuations. Without such analyses, decisions about alternatives will be based on naive assumptions and may lead to erroneous decisions.

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