Valuing a Component Technology of an Integrated Manufacturing Process

Valuing a technology that is part of a bundle of integrated technologies used in a manufacturing process presents additional challenges beyond those encountered when appraising a stand-alone technology. This additional complexity requires significant experience and judgment to properly apply current valuation best practices and conclude an appropriate and supportable value.

Introduction

The valuation of developing and recently-developed technology can be challenging even when it is the only technology underlying a manufacturing process. Appraising a single component technology used in an integrated process that combines *multiple* technologies is even more complex. This incremental complexity arises because the benefits are derived from the total technology "bundle" and are realized from the interrelatedness of the various pieces. In other words, the whole technology bundle provides more utility, and is therefore more valuable, than the sum of the individual component technologies.

To place this issue in context, technology often has a direct, measurable benefit, such as cost savings. These savings can be in the form of requiring less raw material or allowing cheaper inputs. The cost savings can also manifest itself by automating or otherwise reducing the "human capital" required. The technology can also reduce fixed capital costs, for example, by reducing or eliminating certain undesirable byproducts like wastes that require treatment to comply with environmental, safety, or other regulatory constraints. In these circumstances, the value of the future benefits over the economic life of the technology can be quantified and reduced to present value by discounting the benefits using an appropriate rate of return.

In other instances, the technology may yield benefits in a product, rather than the process used to manufacture the product. For example, in the realm of sporting goods, there have been technology cycles in golf and tennis where the equipment has incorporated new, advanced technology that resulted in lighter weight, better accuracy, or greater power. This gave rise to the perception that the average player could improve virtually overnight with this equipment. The economic benefits of such technology can be quantified based on unit price premiums or incremental market share.

The Excess Earnings Method

In circumstances where such direct economic benefits are not present, or cannot be readily quantified, one must resort to alternative means of valuing the technology. One such technique is the so-called "excess earnings" method, where the income stream associated with the technology is allocated to account for the contribution of all other assets that support the income stream. These contributory assets are often primarily working capital, machinery and equipment, and real property, but can include intangible assets such as trademarks or copyrights. Any earnings in excess of the fair rate of return on all contributory assets are deemed to be due to the technology. This method presents three fundamental issues:

- Identifying all categories of contributory assets, which, in the case of new technology, typically comprise working capital and tangible assets. Overlooking the economic "rent" on such assets would otherwise overstate the benefit from, and the value of, the technology;

- Estimating the values and appropriate rates of return for each contributory asset that are commensurate with the asset's risk. Incorrectly estimating the portion of the total benefits allocable to the contributory assets results in a corresponding mismeasurement of the portion allocable to the subject technology; and

- Estimating an appropriate rate of return for the subject technology, as that rate is used to discount any excess earnings to present value after accounting for the contributory assets.

Risk Assessment

The second issue can be particularly problematic, as the required risk assessment analysis poses its own set of challenges. For example, the risk analysis for property, plant and equipment entails an evaluation of possible alternative uses. The more alternative uses and the more active the secondary, or resale market, the lower the risk of the assets. Highly-specialized property with limited alternative use, or that cannot easily be sold, is inherently risky because if the technology fails, the entire investment in that asset may be lost. General use property can more easily be repurposed.

Once these first two issues are resolved and the appraiser has estimated the portion of the aggregate earnings stream that represents a fair return on each contributory asset, the third issue presents its own challenges. Some of the questions that must be answered include:

- What alternative technologies are available, if any?
- What are the strengths and weaknesses of the alternatives compared to the subject technology? This analysis should consider such factors as initial fixed capital cost, physical footprint of the plant; environmental "footprint"; conversion efficiency/yields; energy efficiency; flexibility in terms of use of alternative raw materials; permitting and regulatory requirements; and ramp-up and deployment time.
- What is the regulatory environment, currently and prospectively? Environmental concerns must be considered for virtually any type of process technology.
- In what stage of development is the subject technology? Has it been patented and, if so, how extensive are the patent claims?
- Has the technology been tested on a bench-top or pilot plant basis? All else equal, the closer the technology is to commercial scale deployment, the lower its risk profile.

When the subject technology is not the only technology employed in the manufacturing process, another step is required. Having allocated the earnings between contributory assets and the total technology bundle, the appraiser must now allocate the excess earnings between the subject technology and any other process technology used in the manufacturing process.

Royalty Rates

In certain situations, this issue can be circumvented. In some circumstances, the output could be sold on the open market, rather than serving its intended purpose as the raw material input for other "downstream" processes. If this notional approach is relevant, then a hybrid market-income method such as the "relief-from-royalty" method may be feasible. Unit prices for the products of the manufacturing process are projected based on market data, and a notional revenue stream is developed. This revenue is then converted into a value estimate using market based royalty rates observed in arm's-length licensing transactions for comparable or "guideline" technologies. Value is based on these royalty payments that are avoided by owning the asset or technology. The concept is similar to valuing a house by determining the rent that is avoided by owning the house.

The royalty rates indicated by such arm's-length licensing transactions must be evaluated based on a comparison of the associated technologies and the subject technology. Terms of the licensing agreements are analyzed, such as exclusivity of use, the scope of the geographic markets, the duration of the agreement, and whether an up-front payment is required in addition to the ongoing, or "running", royalties. All else equal, exclusive rights, wide geographic scope, longer term, and no up-front payment generally correspond with higher running royalties.

The running royalty payments are typically structured as a percentage of top line revenue, either gross or net sales. However, it is not uncommon for such royalties to be applied to a different base such as gross profit, operating profit, or pretax profit. Royalty payments based on profit mitigate risk to the licensee, as royalties are only payable if profits are actually realized.

Royalty rates typically are lower when based on top-line revenue, and progressively higher based on the extent to which the licensee's costs are captured in a measure of profit. That is, royalties are typically stated as a lower percentage of revenue and a higher percentage of gross profit, and an even higher percentage of pretax profit.

Once an appropriate royalty rate and base are established, the notional royalty payments are then computed using projections for the relevant royalty base (revenue or profit). These projected notional royalties must then be discounted to their present value

equivalents using a discount rate commensurate with the risk of these payments. For unproven technologies, discount rates are usually much higher than for proven technologies with demonstrated commercial success.

If such a hybrid market-income approach is not practical, an alternate method of allocating the total "excess" earnings between the subject technology and other technologies in the manufacturing process must be identified. The appropriate method depends on the facts and circumstances of the particular technology and situation. One possible option is to use the relative fixed capital costs associated with each technology as a proxy for the relative contribution of each technology to the total "excess" earnings.

Using a reasonable basis for this allocation, the appraiser must then allocate the projected excess earnings between the subject and other technologies. Once this analysis is complete, the excess earnings allocated to the subject technology must then be discounted to their present value equivalents using an appropriate discount rate based on market participant assumptions.

Discounting to Present Value

One useful frame of reference for gauging appropriate discount rates is the venture capital market. Venture capital investments have a higher level of risk for an investor than most other forms of investment. Venture capital investments are typically early-stage or developmental companies, and are privately owned with little or no collateral security or liquidity. To compensate for this higher risk, venture capitalists seek to achieve a higher rate of return than what is offered by more traditional and secure types of investments. This higher level of risk is similar to that of unproven technology. On an investment-by-investment basis, venture capitalists target high rates of return, with an expectation that certain investments will be unsuccessful and may result in a loss of some or all of the original investment amounts. Only by targeting high individual rates of return can venture capitalists achieve an acceptable risk-adjusted return on an overall portfolio of investments.

The rates of return targeted by venture capitalists often range from 30 percent to 70 percent. The lower end is applicable to entities that generate revenue and are profitable. The higher end corresponds to start-ups, where market penetration potential is unclear and business plans lack refinement.

Conclusion

Given the complexities discussed herein, one gains an appreciation for the crucial role of judgment and experience. There is often a lack of explicit market data for such key inputs as contributory asset rates of return and technology rates of return. Isolating the excess earnings from the subject technology is particularly challenging. As has been aptly stated, "Valuation is an art, not a science." This is particularly true when appraising technology that is one part of a bundle, requiring judgment at virtually every step of the analysis.

Appraisal Economics has over 25 years of experience appraising various technologies and the assets of technology firms. We have a seasoned staff of independent valuation experts, including engineers who have significant experience with technology and understand the unique valuation complexities.

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