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VALUATION OF PATENTED INVENTIONS FOR THE PURPOSE OF THEIR COMMERCIALIZATION

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INTRODUCTION

Technology and Economic Growth

The last decade has witnessed sweeping economic changes all over the world. The developing countries, in particular, have undergone a major paradigm shift. Restrictive policies with respect to controls on trade and industry, foreign investment and technological collaborations have been discarded. As country after country has liberalized its economic regime (Annex I), new competitive pressures have come into play.

This period has also seen the successful conclusion of the negotiations of the Uruguay GATT round which extended from 1986 to 1994. The signing of the Final Act by 116 nations at Marrakech on 15 April 1994, acclaimed as the most comprehensive trade deal in the history of mankind, has led to the formation of the World Trade Organisation (WTO). The core principles on which the new international trade regime rests is non-discriminatory treatment based on most-favored-nation status and on opening up of trade between countries unfettered by the high walls of protection.

As new opportunities open up, the critical role of technology as a driver of economic growth has come to be acknowledged. Neo-classical economic theory attributed growth in output to increase in the factors of production, namely, labor and capital. Recent experience of nations shows that contribution of raw materials, and in many cases of labor, has steadily declined in providing competitive edge to the products: their percentage in overall costs has reduced.

This is perhaps best reflected in micro-processor technology where raw material content has steadily fallen to an insignificant proportion of its price. Increasingly, the contribution of most new products comes from value addition through technology.

The recent economic achievements of many countries have not sprung from their natural resources. Malaysia's prosperity, for example, is no longer based on tin and rubber. Countries rich in natural resources, on the other hand, for example oil producing countries of Middle East, are not the great economic powers.

There is now overwhelming empirical evidence that innovation and creativity bring competitive advantage to nations. Per capita economic growth of countries is driven increasingly by innovation, not by aggregate capital investment per se. Economic progress requires a constant stream of new ideas and products to improve quality of life, regardless of whether the innovation is a simple gadget or a sophisticated invention.

With limited resources at the disposal of any one nation, it is logical to benefit from other strengths through technology transfer. We are witnessing an increased inter-dependence in global trade and technology as costs and risks of new products and process development increase. Strategic alliances between companies such as licensing agreements, joint ventures, mergers, acquisitions and cooperative R&D agreements are proliferating, cutting across national borders and cultures. Alliances seek to learn and acquire from each other technologies, products, skills, and knowledge that are not available to other competitors. New

relationships between enterprises are setting new standards in making it easier to do business together.

Growing Role of IPR

These new economic forces have greatly increased reliance on intellectual property rights. Portfolio of IPR assets is an important route adopted by many companies for licensing and joint ventures. IPR is a powerful tool to face the competitive market forces in addition to the traditional techniques of inventory management, human resource development and total quality management. The new financing techniques, leveraged buy-outs, and mergers too have led to emphasizing the role of intellectual property portfolios in companies. IPRs are being pledged as security for loans and assessment of the real worth of businesses increasingly require valuation of their intellectual property portfolio.

At the corporate level there is an increasing realization that control over technology, new products and processes provides the cutting edge. The focus is on design competence through innovation and invention. Analysis of product life cycle reveals that their falling contribution as they mature. The upgrading of these products and the introduction of new ones, the planning from commercial launch to withdrawal from market, demands well-planned technology inputs (Slides 1-3, at Annex III).

As nations and corporations chalk out their new strategies, where technological superiority determines success, the question of valuation of patented inventions for the purpose of their commercialization assumes great importance.

PATENTS & PROPERTY

Technology transfer is not simply a matter of acquisition: it is not merely transfer of capital or handing over of the blue prints or framing of legal agreements. Technology has to be 'created' before it is transferred and then assimilated and upgraded. The process starts with innovation and ends with innovation (Slide 4, at Annex III).

The neo-classical economic theory assumed technology progress essentially an exogenous phenomenon. Current understanding of economic growth is at variance with this view which regards technology as a 'free good.' It is now widely acknowledged that technological progress occurs precisely as a result of entrepreneurial activities in anticipation of profits from innovations. A sound patent system contributes to the transfer of technology by providing a legal environment which is conducive to encouragement of technology transfer.

Before discussing the question of valuation of patented inventions, it is useful to recapitulate some of the basic concepts of intellectual property.

- **Movable Property**: Here the owner has the legal and exclusive right to use his property. The owner may authorize others to use his property but such authorization is legally necessary.

- **Immovable property**: such as land and buildings. There are limits to the use of such property, for example, the requirements to be fulfilled when constructing a building.
- **Intellectual Property**: This is the creation of the human intellect. To put in simple terms, intellectual property relates to information which can be incorporated in tangible objects and reproduced in different locations. Like the movable and immovable property, intellectual property is also characterized by limitations of law, for example, limited duration in the case of copyrights and patents.

VALUING INVENTIONS

Valuation of inventions is central to working out the cost of technology for transfer purpose and to ascertain the value of the company's intellectual property portfolio.

Valuation, however, is not easy. I should point out at the outset that there is no agreed formula, or a common approach, to the valuation of technology. It has been remarked that it is easy to predict a person's contribution to a society when he or she is grown up and we can ascertain the usefulness of that person's contribution by ascertaining age, education, work experience and accomplishments but valuation of inventions is like predicting the future contribution of a child, if not that of a new born baby. Indeed, many inventions need not have immediate economic benefits to be valuable. Embryonic technology often needs further development before its actual value is realized.

This has led some people to believe that valuation of inventions is not amenable to scientific treatment. They believe the process is based more on 'gut feeling' and intuition than on precise calculations.

APPROACHES TO VALUATION

Others have made serious attempts to develop models to evaluate inventions, using mathematical methods. This approach attempts to work out equations which supposedly help in determining the invention's true value.

The ultimate measure of the value of an invention is that a buyer is willing to pay and that the seller is willing to accept the price. In reality, we need to combine scientific methods with those of market forces.

Some basic concepts used for evaluating inventions are:

Figure 1

Market Approach

This is perhaps the simplest way to approach. Here, 'fair market value' is taken as the amount at which the invention profitability would exchange hands between a willing buyer and willing seller. Equity is viewed as an exchange in which neither party gains an advantage in terms of the sale.

The market method depends on what others have paid for similar technology and relies on the concept of 'prevailing industry standards.' The difficulty with industrial property valuation is that one does not always know what others are paying for similar technology since such sales or licensing statistics are not as readily available. Nevertheless, there are 'industry norms' which licensing/acquisition professionals generally know.

The market approach, however, is not widely prevalent in valuating inventions because fair market value of many elements have to be taken into account. These include the present and potential market and present value of future cash flows. Money by itself has no value. It is only when it operates in the time dimension that it obtains value. The longer you wait for your money, the less it is worth.

It is, therefore, important when deciding upon structure of the license to take into account taxation, discounted cash flow comparisons and security of future income.

Over and above these, it is essential that the assessment of all aspects of the technology transfer is seen in the whole context of the venture. Some of the considerations are:

Size: Is there a market for the product of the technology?

Scale: Is the scale of operation of the technology appropriate to that market

Maturity: Is the technology market proven or is it new which will require further development?

Obsolescence: On the other hand, is the technology stale which is about to be supplemented by new developments?

Environment: Can the technology be operated satisfactorily in the licensee's environments, both climatic and cultural?

Suitability: Is the technology appropriate for the infrastructure which is available e.g. power supply, telecommunication, transport, waste disposal etc?

Cost Method

This method is broadly based on cost to the buyer for replacing or finding an alternative. In the cost method, the licensee must calculate the expenses which could occur if the buyer did not acquire the technology. This could involve the expenses (including the uncertainty of success) to 'invent' a new invention which would be better than the existing technology; the cost to find an alternative invention to serve the same purpose; or the cost (including uncertainty) of inventing around' a particular patented invention. Thus some of its components include:

- The cost of reproduction
- The cost of replacement
- Depreciation cost
- Original cost
- Book cost.

Understanding of many of the above terms vary from country to country but there are specific accounting definitions for each of these concepts.

In IPR, costs are usually not depreciated as they are written off in the year in which they are incurred. Their book cost, which is the original cost less depreciation, is therefore not usually used in developing an economic evaluation of innovation.

There are several factors in valuation of inventions which ultimately get embodied in technology transfer agreements. The compensation is often not solely related, if at all, to the value the invention has to the success of the licensee. Expense incurred in transfer of know-how is one such example. Among other difficulties in putting a cost to these elements is the

importance of actual time when the development began. The valuation is usually based on the historical costs and depends largely on the accuracy of financial record keeping.

A major danger in cost approach to evaluation of invention is that not all development approaches based on inventions lead to successful products. A number of inventions, duly backed by engineering effort, do not lead to ultimate market success. How should these costs be included in the cost base for the successful products? How do we apportion the failed product development costs to the cost of successful inventions?

Income Technique

This measures the value through the present worth. Economic benefit is defined as income less expense over the invention's life span.

A time is assumed over which the invention will generate income. A risk is also assigned to predicted income. Inspite of due diligence and caution, no one can eliminate the uncertainty associated with forecasting the future. Thus it is reasonable to assume that, in commercialization, an invention is likely to fail. The chances are further increased in the face of rapidly changing technologies. The value of an asset is the present value of its future stream of economic benefits.

Some important considerations in the income technique are:

* **Net Cash Flow**

The net cash flow takes into account costs of doing business, keeping in mind the additional capital investment needed. The net cash flow includes the amount of future benefits, the potential for benefits; and, the duration over which these benefits will be accrued.

Profitability: This aggregates the costs, such as wages, raw materials, sales and other overheads.

Competition: The strategies of competitors can effect the cash flows and must be taken into account. A unique product will command a high price. Where there is competition, gross margins will be lower. Competition, price cutting will probably result.

Capital requirements: This can reduce the amount of future net cash flows due to demands on cash for new assets.

Actual value: Inventions are often in nascent stage of development. They may need further inputs and application before they produce economic benefit.

* **Discount rate takes into account the following:**

Inflation: the rate of inflation diminishes the value of future economic benefits and must therefore be taken into consideration.

Liquidity: Inventions, during their early days do not provide the benefit of quick conversion into cash.

Real interest: This is the return on investment after foregoing the alternative opportunity of the invested funds.

Risk premium: This is the return investors expect for the assumption of risk.

In determining the value of intellectual property rights, the cost of the original research and development is usually not included. They are necessary but irrelevant as regards calculating the value. Many millions of dollars can be spent upon R&D, but if the final product does not have any application, it will have no value.

A simple formula usually is:

$$V = I/r$$

V = Value of the income from the property

I = Income derived from the property (income less expenses); and

r = Capitalization rate that includes risks influencing the anticipated earnings.

The income accounting technique is suitable where the outcome of inventions can be evaluated fairly accurately in terms of cash income. Where it is not possible to give specific value to the commercialization of invention, this system is not useful as it leads to assigning arbitrarily value to intellectual property.

The income method presumes that expected sales income sets the value. A typical calculation in the income method is to estimate the market potential of the technology, predict a portion of the market size that a company could realistically expect to capture and then to assess a royalty on the sales to work out the total value of the technology.

Practical Methods

What are the practical ways to value an invention? When possible, the financial aspects should be the primary basis for a business evaluation: i.e., the revenue potential and the cost. But just as important is to judge the probability of success. In the context of university research a useful checklist has been evolved which allows consideration of several categories to evolve an overall picture. The purpose of such checklists is to give one a general idea of the economic potential of the invention.

One such checklist, used at Stanford University is shown at Annex II (I am grateful to Dr. Katherine Ku, Director, Office of Technology Licensing, Stanford University, for explaining the working of this list to me). Obviously, one can develop checklists that are more detailed or more numerically based.

FORMS OF COMPENSATION

The relation between royalty and the technology cost embodied in inventions is often not simple. A royalty must always be expressed in relation to the stated base, for example the sale price or manufacturing cost.

My experience of negotiating technology transfer agreements shows that royalty payments are not based on carefully worked out technology costs. They are more an outcome of what the licensor can extract to the maximum. 'A reasonable royalty', according to one US Federal Court judgment, 'is the amount a person, desiring to manufacture, use, or sell a patented article as a business proposition, would be willing to pay as a royalty and yet be able to make a reasonable profit.'

The other area of concern is the ways in which monetary compensation is decided. A license usually includes royalty payment by the licensee. For exclusive licenses, the licensee acquires the sole rights within the specified territory. It may call for an initial royalty followed by a minimum annual guaranteed royalty payment. The minimum payments are included as an incentive to promote the license.

Royalties, on the other hand, may reduce if the licensee has rights which are of interest to the licensor. In this case, a cross-license may be entered either free of royalty or with royalty at reduced rates. Other arrangements which influence valuation of invention for purpose of commercialization may include a 'most favored licensee' clause, or some technology rights in favor of the licensor and a right of the licensee to grant sub-licenses.

The calculation of value of invention in the context of currency exchange fluctuations also needs to be appraised. The currencies need to be specified and compensation received preferably at quarterly intervals.

The ingenuity of financial specialist in setting up these compensations is vast and they finally determine the value assigned to inventions. Some of the options are:

- An upfront payment
- Stage payments
- Payments pro rated to licensee sales
- Guaranteed minimums
- Payment for services of licensor's staff
- Payments for training of licensee's staff
- Amount of expenses incurred in traveling and subsistence of licensor's staff
- Payment for the services of outside professional experts, such as patent agents and lawyers
- Information exchange

Some of these methods are just as creative as the inventions they attempt to value for commercialization.

CONCLUSION

Some of the methods outlined in this presentation highlight various pathways of valuation of inventions for purpose of commercialization. They point out the variety of options available in working out financial compensation as a part of overall technology transfer.

Costs integral with commercialization of invention include costs of the so called 'show-how,' that is, demonstrating to the licensee the working of the invention and successfully transferring the product and know-how for successful commercialization.

Reliance on costs as a basis for valuation of invention can become misleading as the amount spent to develop know-how is usually not the same as value of that know-how. Adequate return needs to be based on value, not on cost. This includes consideration of the potential income, an estimate of the risk involved, realization of that income, cost of obtaining the income, time value of money and the duration of the license.

Return on sales is the common approach but also has the weaknesses that the licensor's own market experience often overlooks the value and the investment risk associated with the new know-how.

None of the different ways of valuation of inventions are sufficient in all cases to provide a correct indication of the fee for commercial exploitation of the efforts. The theory and the established practices, however, provide guidance in arriving at equitable value of commercializing inventions. The increasing role of technology in economic growth and the growing transfer of IPR for competitive performance within and across borders makes this an important issue.

[Annexes follow]

Trade liberalization in developing countries

	Country	Nature of Liberalization
1	Algeria	Import licensing abolished in 1991
2	Argentina	Tariffs reduced in 1988. Import licensing relaxed in 1988 and 1990.
3	Bangladesh	Import prohibition and tariffs reduced since 1985.
4	Bolivia	Tariffs reduced in 1988 and 1990.
5	Brazil	Tariffs reduced in 1988, 1989 and 1991. Import licensing eased since 1987.
6	Cameroon	Tariffs and non-tariff barriers reduced in 1990.
7	Central African	Import licensing and quantitative restrictions eliminated since 1986.
8	Columbia	Tariff reduced in 1989. Non-Tariff barriers reduced since 1990.
9	Costa Rica	Tariff reduction in three years.
10	Egypt	Tariff reduced in 1986 and 1989. Import prohibition eased in 1990.
11	Ghana	Import licensing eliminated in 1989.
12	Guyana	Import prohibitions removed in 1988.
13	India	Delicensing and import liberalization in 1991.
14	Indonesia	Tariff reductions since 1985; import licensing relaxed.
15	Madagascar	Tariff structure simplified in 1988.
16	Malawi	Import liberalized in 1988 and 1991.
17	Mexico	Substantial reforms since 1985; tariff reduced in 1986 and 1988; import licensing eased in 1990.
18	Morocco	Import licensing eased since 1987.
19	Nigeria	Import licensing eliminated in 1986.
20	Nicaragua	Tariffs reduced in 1990.
21	Pakistan	Reforms since 1988. Non-tariff barriers replaced by tariffs and tariffs reduced; Import licensing eased in 1991.
22	Peru	Tariffs reduced in 1988 and 1991. Tariff structure simplified in 1990 and import licensing eased in 1989 and 1991.
23	Philippines	Quantitative restrictions reduced in 1988 and 1990, import licensing eased in 1990.
24	Sri Lanka	Tariffs reduced in 1988 and 1991.
25	Thailand	Tariffs reduced in 1988 and 1991.
26	Togo	Import and export licensing eased in 1988.
27	Tunisia	Import liberalized in 1987, tariffs reduced in 1988.
28	Turkey	Tariffs reduced in 1989, import licensing abolished in 1990.
29	Venezuela	Tariffs reduced in 1989 and 1990.

Source: Report by the Director General, GATT, International Trade & Trading Systems 1991