Matrix Approach to Pricing

A flexible pricing system which takes into account the uniqueness of licensing objectives

BY RICHARD MARLOW*

One of the major difficulties encountered in reaching agreement on a license is the fee structure to be paid. In a recent private study on how major companies develop their licensing programs, to which the writer's firm acted as consultant, the following comments were elicited:

"The fee should not be so large as to make the item licensed noncompetitive," and, "When a fee rate is equitable to both parties, there is less inclination on the part of the licensee firm to infringe or design around a company patent."

And again, "Fees should be reasonable — the licensee is not a competitor or an antagonist but should be treated as a business partner and should be charged only a reasonable portion of, in effect, his net profits, leaving him sufficient motivation to implement the licensing agreement."

While each of these commnts is general in nature, each expresses a philosophy that all parties to the agreement are entitled to a reasonable return on their investment or on the time, energy, manpower etc. expended.

One company attempts to establish more concrete parameters for determining pricing. In each instance it asks:

1. What did the technology cost to develop?
2. What would it cost the licensee to duplicate the technology?
3. Can the technology in question be protected from use by others as the result of existing patents?
4. Can these patents be designed around?

Unfortunately, the above questions, when answered, are not definitive as to the value of the technology in the marketplace. If the technology is an offshoot of work in another program which is being used by the company profitably then from an accounting standpoint, the cost of development has probably been changed to that other technology, leaving a zero or relatively minor cost basis for the technology under consideration for licensing. On the other extreme is the situation in which work was undertaken to develop this technology for a specific purpose and either the technology developed failed the purpose or could not otherwise be used. If in this case the cost of development was high (and assuming that it would be equally high for others) then again no relationship can be established between cost and value in the market. Again looking at the technology from an accounting standpoint all expenditures to date are "sunk" costs. They have been spent, and cannot be recouped. In such a case, our effort should be directed toward reducing our absolute loss rather than totally recouping our out-of-pocket expenditures.

*Vice-President, Associated Products, Inc., subsidiary of Nabisco, Inc., New York, N.Y.

Rules of Thumb

Two respondents had established rules of thumb which they used in approaching the question of price. The first indicated that 25% of the licensee's profits were reasonable, up to 50% were bargainable and above 50% were questionable. The second used as a benchmark one-fourth to one-third of the licensee's profits. The difficulty with this approach is that it necessitates a close monitoring of costs, allocation of costs etc. and unless very definitive standards are established in the license agreement future difficulties may be encountered. Remember, your cost structure may be vastly different from your licensee's.

Each license agreement is based on an individual set of objectives. To merely rely on rules of thumb or a methodology set in concrete is to negate this very important fact. The use of a matrix in determining price permits a flexible pricing system not only between differing licensing agreements but within a single agreement where countervailing forces are at work which permit for one value under one set of circumstances and another value under some other sequence of events.

Looking at a hypothetical situation we might find company A, a supplier of basic staple yarns, with a technology which permits knitted fabric manufacturers to duplicate the appearance of lace products. This new technology could be in any stage of yarn preparation or incorporated into the knitting process. Let us assume that the technology in question is an add-on to the existing needle bed technology incorporated into most knitting machines. The technology might be valuable to company B, a manufacturer of the knitting machines in question or possible to company C, a company that services and overhauls this type of equipment.

Company A is primarily interested in further extending its primary product line, staple yarn. Each new application developed expands the present marketplace for its product. Company A, while wishing to derive value from its newly created technology would most like to marry the two profit thrusts and maximize both.

Company B is interested in the new technology as a basis for placing a new generation of knitting machines on the market. From its standpoint it is not optimal to develop a piece of equipment that can be adopted to the current machinery on the market. Much more valuable would be the position of developing a machine which could manufacture the current product and also produce a lace effect as well.

Long Time Span

Company B's thrust would produce revenue from the purchase of new machinery but this would encompass a long time span and the immediate effect on demand for A's yarn would not reach the proportions sought by A.

200	-	-	-	-	-	-	-	N
180	-	-	-	-	-	-	N	+
160	-	-	-	-	-	N	+	+
140	-	-	-	-	N	+	+	+
120	-	-	-	N	+	+	+	+
100	-	-	N	+	+	+	+	+
80				20%	Royalty			
60				30%	Royalty			
	3,900	5,200	6,500	7,800	9,100	10,400	11,700	13,000

Fig. 1

Company C, on the other hand, is not interested in developing new machinery but rather maintaining the old. Its primary source of revenue is from the maintenance and repair of equipment which has outlived the original purchase service contract. Inasmuch as C would use the technology for converting old machinery to a dual use it is conceivable that A's yarn would be in greater demand during those instances when the application replaced was not one using a yarn produced by A.

Optimally, A would like to see a universe in which B would acquire the technology and then embark on a program that would ultimately result in expanded knitting capacity, greater demand for A's product and further penetration of the consumer market to make products using A's yarn more available cost-wise and more desirable design-wise to the end user. Accordingly, cost of transfer over to this new technology must be reasonable for the manufacturers of the knitted product to cost justify the capital expenditure.

The question then becomes, is there a method by which these countervailing forces can be measured allowing for price to be established on a flexible basis to meet each of many differing sets of circumstances. It is suggested that matrix pricing is such a methodology. The remainder of this paper shall be taken up in explaining the wherefores of a matrix and then creating a pricing method for our hypothetical company and its technology.

Definition

A matrix is defined as "something within which something else originates or develops." By setting constraints, the boundaries of the matrix, you can develop relationships which have an ascending or descending value depending on the construct of the matrix. For purposes of this paper we will work with two boundaries, a two dimensional matrix. Matrices can be constructed using 3, a three-dimensional matrix, 4 or more boundaries. Once you begin working with 3, 4 or greater dimensions a computer is absolutely necessary to do the calculations.

The boundaries of the Matrix are called the vectors. A two-dimensional matrix appears as follows:

A three-dimensional matrix has the third vector:

Draw two lines at right angles to each vector within the confines of the matrix. At the point at which the lines cross you would have created an interse:

Filling in with more lines creates cells.

If we assume that company A has a dual interest in its technology, one to receive a portion of the sales price of equipment incorporated that technology, the other in expanding the market for its primary product, yarn, we can see that it is to the advantage of Company A to attempt to induce company B to sell as many machines as possible over the life of the license. Our two boundaries for the Matrix are then revenue generated and number of machines sold. Using a normal curve we may determine a selling price which will optimize those two constraints. At differing sales prices more or less machines will be sold. If it were important that as many machines as possible should be sold in the early years of the license, affecting the price that should be charged during that period, then a third vector should be established accommodating that third constraint. This is often a realistic preoccupation when one considers the life span of patents as well as accelerating rates of obsolescence.

Using the two boundaries of revenue generated and units sold our matrix can now take form. Let us assume that a typical single function knitting machine normally sells at $50,000 and that a dual function knitting machine should demand a price of $65,000. Based on historical data, Company B, in the normal course, should sell 100 of these machines in a 12-month period. Its normal gross profit would permit a 10% royalty to be paid, assuming that the added on technology can demand a price in excess of the proportional add on of manufacturing cost, thus maintaining Company B's historical gross profit margin.

If we use increments of 20 (just as an example) we can say that each 20 machines sold should produce a normal revenue of $1,300,000. At these normal increments we would receive a normal royalty of $130,000. But we expect at least 100 machines to be sold which will generate $6,500,000 of gross revenue and $650,000 of royalty payments. These two numbers, 100 units and $6,500,000 represent that cell in our matrix which will provide a normal royalty. Multiples and divisions of those two cells also reflect situations in which a normal royalty might be provided. All other cells provide either more satisfactory or less satisfactory results based on our dual objectives and will be weighted accordingly.

For purposes of this exercise we will state that sales of less than 100 units in a 12-month period should demand a higher royalty inasmuch as the market potential has not been achieved.

In simple terms the matrix would appear as Fig. 1.

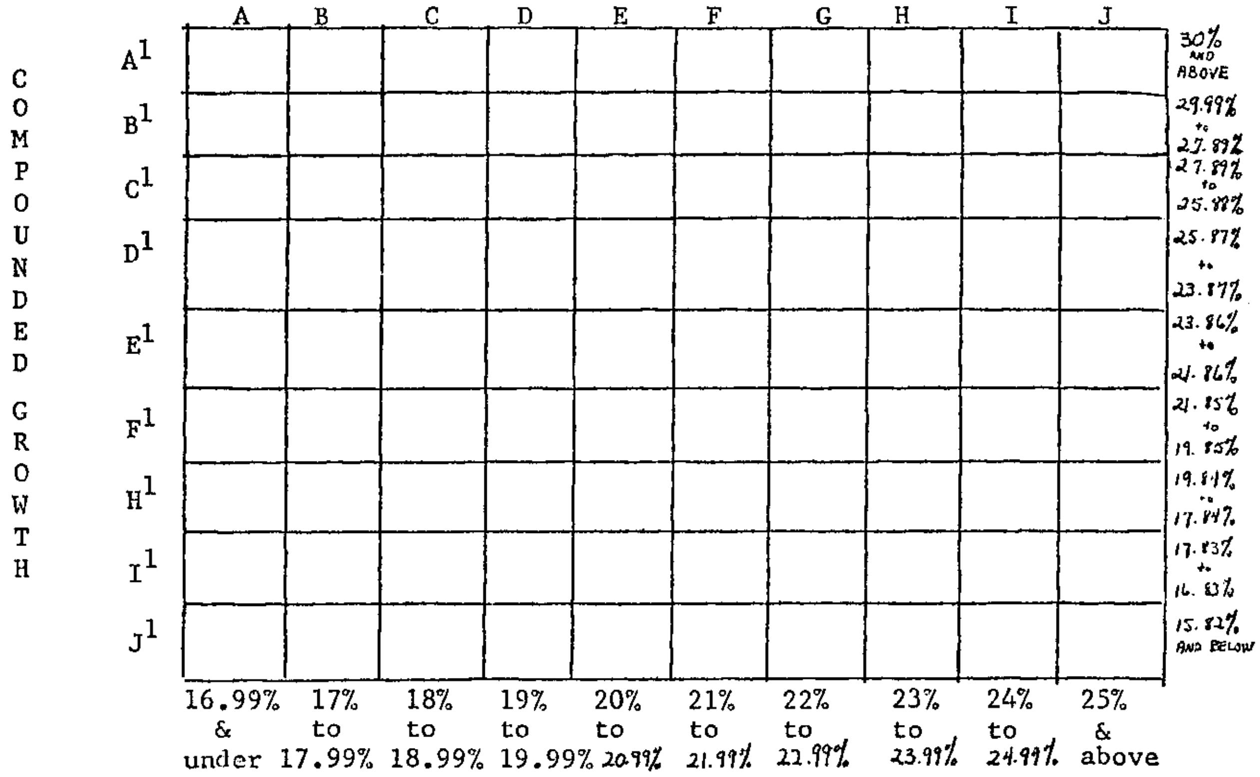

Fig. 2

At the 60- and 80-unit levels a greater commission is charged, regardless of revenue generated, as a penalty for not making the minimum budgeted sales.

At 100 units and $6,500,000, 120 units and $7,800,000, 140 units and $9,100,000, etc. a normal royalty is to be paid. Company B is reaping a normal result of increased production, which resulted for external forces demanding the product without a reduction in sales price.

When Company B reaps additional windfall by charging a higher price per unit then we share in those revenues by receiving a plus normal royalty, all cells with a + in them. The rational here is that additonal machines might have been sold had a lesser price been charged. Therefore one of our objectives has not been met. If we could determine the amount of yarn that would normally be consumed on each additional machine per year we would be in the position of being able to calculate the loss of revenue from those forfeited sales. Each lost machine could then be translated into a dollar value and using our matrix incorporated into the royalty to be paid.

Should Company B take a more aggressive marketing stance and sacrifice price to increase unit sales then we should be willing to reduce the royalty paid to take into account that our objective to sell yarn will benefit accordingly.

Underlying all of this discussion is the premise that only our yarn can be used satisfactorily on these machines. This situation is probably typical. Although the same type of calculations can be made if Company A can postulate its favorable "fair share" any market for the type of yarn in question.

When actually building a matrix you will have to establish your constraints using class boundaries. Be careful to remember that all class boundaries should be equally populated with no overlapping of population. In Fig. 1 the unit class boundaries would have been in increments of 20. The first class would have gone from 60 to 79, the second from 80 to 99 etc. The revenue class boundaries for the first two classes would be $3,900,000 to $5,135,000, $5,135,001 to $6,435,000 and then so forth.

As a second example, let us suppose that we have a pool of technology which we have developed but have not fully exploited. Our sales are currently $2,000,000 and our gross profit margin is 20% or $400,000. Due to limited manpower and dollar resources we are unable to develop fully this product, yet we realize that eventually our patents will be designed around, thus permitting exploitation of the market by others. We could sell the technology outright but the price we would receive would not fully reflect, in our minds, its true worth. Entering into a joint venture might lessen the demand on our critically short cash but would most certainly represent a continued drain on our limited manpower resources. A viable alternative to the above would be a licensing arrangement whereby we continue to profit in the technology in future years, perhaps with a buy in arrangement incorporated into the license agreement.

Under such a set of circumstances we are once again confronted with dual purposes — to maximize royalty revenue on the one hand and to maximize market potential on the other. We seek a trade-off that favors an additional unit being sold to an extra dollar being generated. One way to express this is to say that our goals require that gross margin be sacrificed over the near turn in favor of total dollar volume. Further, our measure of success will be tied to compounded growth over the first five years of the license, after which we will revert to a "normal" royalty fee. The matrix incorporating the above constraints might appear as Fig. 2.

Compounded growth	5.20% to Below	5.21 to 5.317	5.318 to 5.425	5.426 to 5.533	5.534 to 5.641	5.642 to 5.749	5.750 to 5.857	5.858 to 5.965	5.966 to 6.073	6.074 to 6.181	6.182 to 6.289	6.290 to 6.397	6.398 to 6.505	6.506 to 6.613	6.614 to over
24.1 and up	NO PAYMENT	1.545	1.580	1.615	1.650	1.685	1.720	1.755	1.790	1.825	1.860	1.895	1.930	1.965	2
22.1 to 24	NO PAYMENT	1.512	1.547	1.582	1.617	1.652	1.687	1.722	1.757	1.792	1.827	1.862	1.897	1.932	1.967
20.1 to 22	NO PAYMENT	1.478	1.513	1.548	1.583	1.618	1.653	1.688	1.723	1.758	1.793	1.828	1.863	1.898	1.934
18.1 to 20	NO PAYMENT	1.445	1.480	1.515	1.550	1.585	1.620	1.655	1.690	1.725	1.760	1.795	1.830	1.865	1.900
16.1 to 18	NO PAYMENT	1.412	1.447	1.482	1.517	1.552	1.587	1.622	1.657	1.692	1.727	1.762	1.797	1.832	1.867
14.1 to 16	NO PAYMENT	1.379	1.414	1.449	1.484	1.519	1.554	1.589	1.624	1.659	1.694	1.729	1.764	1.799	1.834
12.1 to 14	NO PAYMENT	1.346	1.381	1.416	1.451	1.486	1.521	1.556	1.591	1.626	1.661	1.696	1.731	1.766	1.807
10.1 to 12	NO PAYMENT	1.313	1.348	1.383	1.418	1.453	1.488	1.523	1.558	1.593	1.628	1.663	1.698	1.733	1.768
8.1 to 10	NO PAYMENT	1.280	1.315	1.350	1.385	1.420	1.455	1.490	1.525	1.560	1.595	1.630	1.665	1.700	1.735
6.1 to 8	NO PAYMENT	1.060	1.095	1.130	1.165	1.200	1.235	1.270	1.305	1.340	1.375	1.410	1.445	1.480	1.515
4.1 to 6	NO PAYMENT	.604	.639	.674	.709	.744	.779	.814	.849	.884	.919	.954	.989	1.024	1.059
2.1 to 4	NO PAYMENT	.324	.359	.394	.429	.464	.499	.534	.569	.604	.639	.674	.709	.744	.779
2	NO PAYMENT	.045	.080	.115	.150	.185	.220	.255	.290	.325	.360	.395	.430	.465	.500
0 to 1.99%	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT	NO PAYMENT

Net after tax profit

Fig. 3

In developing the value of each cell we would concentrate on our objective of maximizing unit sales by weighing the matrix so that the licensee is encouraged to forfeit gross profit if additional unit sales will thereby be generated. In this instance AA' would represent our greatest benefit coupled with the poorest contribution to gross profit for the licensee. At this level we should seek the smallest amount of royalty to compensate the licensee for his sacrifice.

JJ', on the other hand, expresses the reverse situation, that of the licensee maximizing gross profit while producing the lowest level of compounded unit growth. In this situation the licensor should be entitled to a maximum royalty, one which would exceed a normal payment.

Once the smallest or largest payment has been agreed upon, or a normal payment if normal conditions of compounded growth and contribution to gross profit can be agreed upon, the cell value for each cell can be determined using the relationship of comparative cell values.

It is not suggested that the matrix approach is the only or even the right approach in each instance when confronted with the question of price. Rather, it is an additional tool which can be used under the proper circumstances.

Fig. 3 is a copy of a matrix which the author developed during the course of a negotiation.