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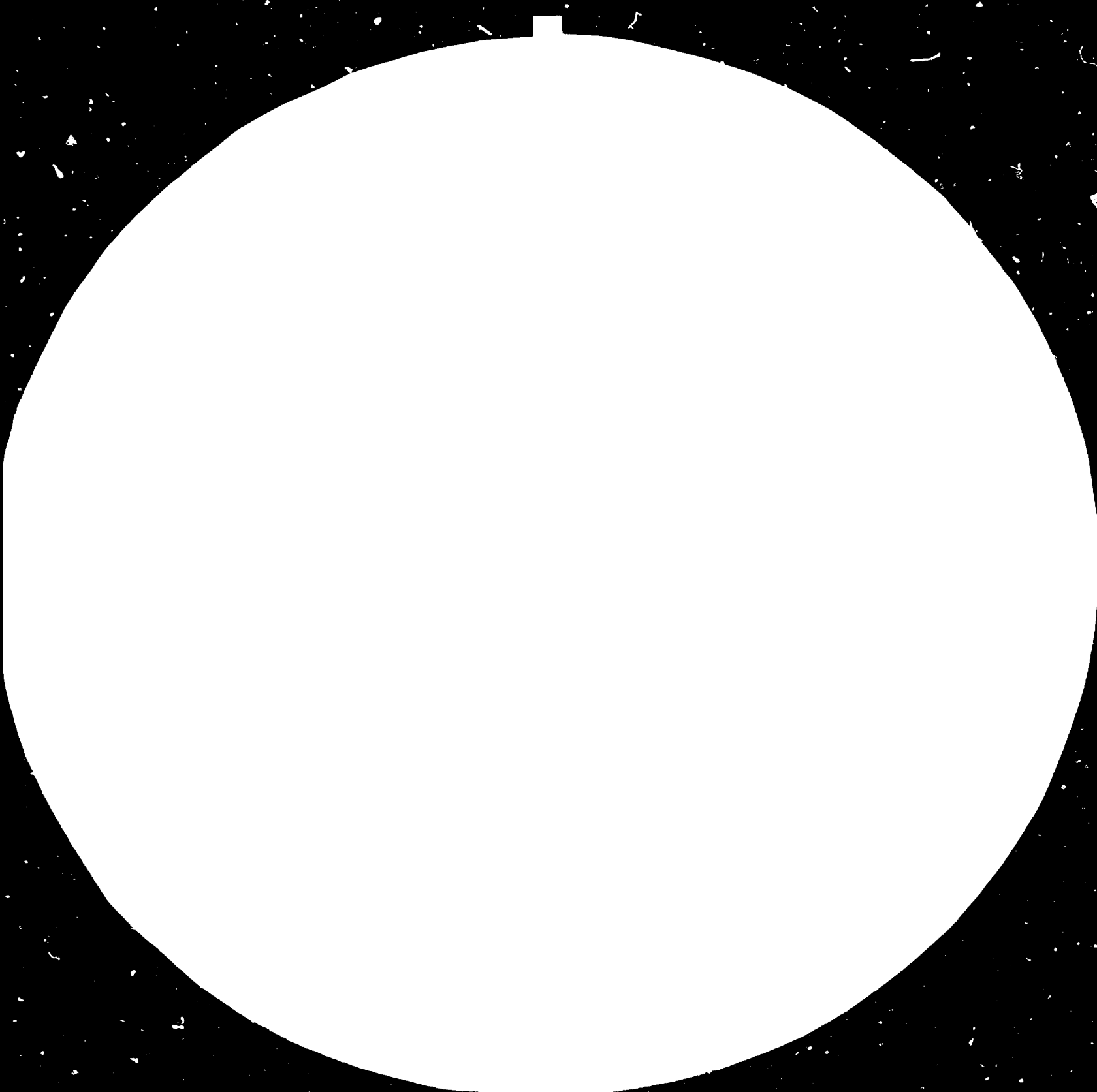
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TECHNOLOGY PAYMENT EVALUATION,
SUMMARY RESULTS OF A PILOT EXERCISE*

by
UNIDO Secretariat

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INTRODUCTION

The New Delhi meeting of Heads of Technology Transfer Registries reviewed the progress made with the pilot exercise on technology payment evaluation based on the concept of profit sharing. This exercise was initiated by UNIDO in order to review present evaluation methods used by registries and to assess the value of the UNIDO promoted criteria for the evaluation of technology transfer payments.

It was concluded at that time that the payment evaluation method prepared by UNIDO be used as an additional tool for such evaluation. The meeting stressed however the limitations of the methodology and the need of further testing by member countries.

The Indian Registry has acted upon this recommendation and applied the method upon a sample of 50 contracts and reviewed the results as compared to the results obtained by the Portuguese and Philippines Registry.

This paper summarises the progress made so far and indicates further areas of research.

I. OBJECTIVES OF LICENSOR, LICENSEE AND STATE vis-à-vis TECHNOLOGY PAYMENTS

1.1. Objectives of licensor and licensee

It is generally accepted that the principal objective of an enterprise is profit maximization. The fact that two enterprises are co-operating with each other, must therefore be seen in this context. In the case that the recipient enterprise is a public enterprise profit maximization is often associated with some economic and social objectives.

It is therefore attempted to classify the various means to increase profits of the Licensor and Licensee in Table (1). The licensing agreement will reflect one of these objectives (or a combination) depending on the corporate strategies of the parties involved.

The price of technology will depend on to what extent the licensee and licensor see these objectives realized through their collaboration agreement.

A detailed listing of the factors which will affect the ability of generating profit, and as such will determine price of technology is listed in Table (2) when it concerns private enterprises, and Table (3) and (2) when it concerns public enterprises. It can be observed from these tables that many of these factors will be influenced by a variety of factors which in many cases cannot be quantified and will depend much on the negotiation itself.

OBJECTIVES OF LICENSOR AND LICENSEE

Table 1

	LICENSOR OBJECTIVE	PROFIT MAXIMIZATION	LICENSEE OBJECTIVE
	DETAILED LICENSOR OBJECTIVES IN SELLING TECHNOLOGY		DETAILED LICENSEE OBJECTIVES IN ACQUIRING TECHNOLOGY
Technology R and D	<ul style="list-style-type: none"> - To earn royalty income or other kind of income from the technology sold - Desire to speed up return of R and D costs connected with the sold technology - Possibility to establish technical co-operation such as cross licensing agreements, leading to the setting-up of joint ventures 		<ul style="list-style-type: none"> - Avoiding risk of R and D - Avoiding high costs of R and D - Lack of R and D facilities - Supplementing the licensee's own research and/or to obtain continuing access to technical help or ongoing R and D to others
Market	<ul style="list-style-type: none"> - Market extensions - To reach markets not otherwise reachable, when direct sales in a particular area are difficult or impossible - To adapt a product to a local market - To increase profits by supplying products, services, raw materials, equipment, spare parts . . . to the licensee - Difficulty in setting up a fully-owned subsidiary or to reduce the capital requirement for reaching a market - Building up the overall reputation of the licensor 		<ul style="list-style-type: none"> - Desire to enter foreign markets - Desire to counter strong competition at the local market - Desire to profit by important outlets for import substitution
Production	<ul style="list-style-type: none"> - Access to a low cost labour and/or to buy an equity interest in a company - Processing raw materials where they lie 		<ul style="list-style-type: none"> - Desire to increase the quality of its products - Desire to buy technologies adapted for local conditions

FACTORS INFLUENCING THE PRICE OF TECHNOLOGY

Table 2

Market	<ul style="list-style-type: none">- Size- Type of product- Competition . . .
Technology	<ul style="list-style-type: none">- Technological level of the process (nature of solved technical problems, degree of novelty, and originality, technical and economic advantages over prior arts . . .)- Existence of competitive technologies and degree of competitiveness over them- Existence of alternative technologies and probability of their development- Pace of technical innovation in the industry concerned
Protection	<ul style="list-style-type: none">- Scope of industrial property rights involved- Exclusivity and duration of contract- Licensing policies practised by competitors- Guarantees and warranties
Production	<ul style="list-style-type: none">- Absorption of technology- Long range effects on licensee's technical and managerial capabilities- The development stage and reliability of the know-how (pilot scale, commercial scale)

MAIN PUBLIC COMPANIES OBJECTIVES

Table 3

Production	<ul style="list-style-type: none">- Maximization of output- Providing basic industries (infrastructure, electricity . . .) which command the profitability of the economy and which require big investments- Instrument of planning and development- Price fixing
Finance	<ul style="list-style-type: none">- Improving balance of payment- Providing savings for investments
Social	<ul style="list-style-type: none">- Maximization of employment- Model employer- Better distribution of income- Regional development- Development of new skill in the work force- Wealth- Prevention and reduction of pollution
Political	<ul style="list-style-type: none">- National security- Self reliance
Technology	<ul style="list-style-type: none">- Spreading technical innovation

1.2. Objectives of State

The state, as a promotor for technology transfer as an important factor for economic development and as a protector to the recipient enterprise vis-à-vis their bargaining position has a macro and micro economic objective with respect technology payments.

At the micrc level:

- To reinforce the bargaining position of the licensee
- Maximizing the benefit or value of the bought technology
- Fair remuneration, i.e. to make sure that payments correspond with the object of the contract

and at the Macro level:

- Control of balance of payments and minimizing balance of payments outgoes, taking into account both direct and indirect payments
- Minimizing the price paid by the eventual buyer of the product made thanks to the bought technology.

II. PRESENT METHOD OF TECHNOLOGY PAYMENT CALCULATION AND EVALUATION

There exists no standard method for determining a fair price for a technology. Technology fees are calculated as estimates within the framework of pre-investment studies, however, the actual fee mainly depends on bargaining power of the enterprises involved, the respective size and personality, position on the market, financial capacities, licensee capability to adapt and absorb the technology, etc.

Some qualifiable indicators will usually be taken into consideration:

- trends in the sector,
- average rates generally fixed by the companies involved,
- opportunity cost for the licensee (what it would have cost him to develop the technology),
- evaluation of economic advantages (savings)
- potential market to be supplied ...

But there always exists a minimum price for a transfer of technology, namely, the actual cost of the transfer.

With respect to the evaluation of a technology fee by the State through its regulatory agencies, there also does not exist a standard method. Accepted payments depend on trends in sectors and effect on balance of payment in relationship with other contract clauses and development objectives of State.

Finally, no general methods exist or have been developed and used for the determination of "fair payments". Technology payments mainly depend on the bargaining situation and on experience.

In this context UNIDO has developed a method which tries to reduce this uncertainty and to provide suitable criteria for the evaluation and calculation of technology payments.

III. UNIDO METHOD

3.1. Description ^{1/}

According to the profit maximization objective of the partners, technology payments (mainly royalties and down payments) have to be connected to the expected profits of the licensee made thanks to the bought technology. In other words, this signifies which amount the licensee is able to pay for the use of the technology.

Such an approach leads us to evaluate which percentage of the licensee's profits is paid to the licensor. So technology payments are considered as the licensor's share of the licensee's profits ^{2/}. In this way, we can express royalty as follows:

$$\text{Royalty on sales} = \frac{\text{licensor's profit}}{\text{total sales value}} = \frac{\text{licensor's profit}}{\text{licensee's profit}} \times \frac{\text{licensee's profit}}{\text{total sales value}}$$

where $\frac{\text{"licensor's profit"}}{\text{licensee profit}}$ means "the licensor's share in licensee's profits (LSEP)"

and $\frac{\text{"licensee's profit"}}{\text{total sales value}}$ means "the licensee's profit on sales of licenced product"

3.2. Implications

As regards this equation, four important elements have to be developed:

a) The licensee profit is defined in the broadest and simplest sense.

If information and forecasts from the licensee are available, it means:

Licensee's profit = Net Sales Value

- Cost of goods sold (i.e. cost of manufacturing)

- Sales and General Administrative Expense

and then:

Net Profit Before Tax (NPBT) = licensee's profit - Payment to licensor (R)

When no forecasts are available, we can take the average profit rate of the industry concerned.

^{1/} For an in-depth description see:

- Guidelines for Evaluation of Transfer of Technology Agreements, Development and Transfer of Technology Series No.12 (ID/233).
- Guidelines for Technology Transfer Payment Evaluation, Pilot Exercise (ID/WC.383/1).

^{2/} Licensee's profit is defined as the profit made by the use of the technology before paying royalties to the licensor and before paying taxes.

b) Now we can express the initial expression as follows:

$$\text{Royalty on sales} = \frac{\text{licensor's profit}}{\text{licensee's profit}} \times \frac{\text{licensee's profit}}{\text{total sales value}}$$

$$\langle \Rightarrow \rangle \frac{R}{\text{total sales value}} = \text{LESP} \times \frac{(\text{NPBT} + R)}{\text{total sales value}}$$

$$\langle \Rightarrow \rangle \text{LESP} = \frac{R}{\text{NPBT} + R} = \frac{1}{1 + \frac{\text{NPBT}}{R}} = \frac{1}{1 + \text{TTF}}$$

where "LESP" means "the licensor's share in licensee's profit"

"R" means "payment to licensor"

and "TTF" means "technology turnover factor"

The ratio $\frac{\text{NPBT}}{R} = \text{TTF}$ is of interest, for it gives an idea of "the multiplier effect" of royalty payment and the effective use of the technology by the licensee, i.e. "the profit turnover" for payment of royalty.

c) The expected NPBT and the projected amounts paid to the licensor every year and over the validity period of the contract will be calculated and added using the Net Present Value (NPV), a method which takes into account the time-cost of money.

d) Down payments have to be considered as the capitalized value of running royalties over a given period of time. Accordingly, a down payment may be conveyed in a certain royalty rate (always with the NPV method).

IV. APPLICATION OF THE METHOD BY INDIA, PHILIPPINES AND PORTUGAL

So far, the method has been tested in three countries. This chapter puts forward the main results obtained ^{3/} and assesses the possibility for the method to replace royalty rates as indicators for the evaluating, calculating and monitoring of technology payments.

Such an analysis meets a certain number of limits exposed below, in part because the method is not widespread and commonly used. Nevertheless, notwithstanding these limits, it is possible to reach some conclusions and to draw the broad framework for the establishment of a fair technology price.

4.1. Limits to comparisons

In the present state of the art, there are limits for making very reliable comparisons between different countries when using UNIDO method.

The first one lies in the difficulty in collecting data, and consequently we find in the studies different kind of data: historical data, projected data, average rates in the sector, average rates in the company...

Comparison also is difficult, because of the grouping together technologies whose types and levels are different, but could be classified under one ISIC four digit group.

Another difficulty stems from the impact of restrictive clauses and the use and the relative importance of other kind of remuneration.

Furthermore, the concept of profit-sharing in a comparative sense may be hindered because of the various policies carried out concerning technology payments and leading to sectorial priorities, various ways to appreciate royalty rates, different basis for calculating royalty rates.....

^{3/} - "Technology transfer agreements in Philippines, interim mission report", Dr. V.R.S. Arni, 24 February 1982.
- "Technology payments and profit-sharing in Portugal, TIES", Instituto do Investimento Estrangiero, UNIDO, ID/WG.386/6, 14 February 1983.
- "Technology transfer payment exchange system: a comparative exercise, TIES", S.L. Kapur, R.M. Sethi, 7 July 1983.

One also notices that all the companies whose contracts have been studied, make profits over the considered period as a whole. This is due to the impossibility of calculating LSEP rate when the firm is in the red continuously.

The Indian report stresses another important point: problem of taxation. It is to be pointed out that the eventual price of technology turns out to be the total inflow - for the licensor - after taxes. Accordingly, different tax structure on down payments, royalties, dividends may hamper comparisons of LSEP rates.

4.2. Analysis of LSEP rates

The average ratios of LSEP of the different studies vary from about 20% to 35% - it is about 20% in the Philippine study and India (I), and superior to 30% in India (II), (III) and in the Portugese study (see table 4).

For all these studies as a whole, we observe wide variations from less than 2% to 71.4% (except in the Portugese study where it ranges from 16.2% if we do not take account of two routine technical assistance contracts), whereas the standard deviation in the Philippine and Portugese studies is important, respectively 15.7 and 19.36, and shows a wide distribution of data.

Nethertheless, the Philippine study shows that with a 90% certainty, LSEP ranges from 16.32% to 27.30%.

In the India (II), it can also be seen that for the same product, the LESP varies considerably on agreements which have concluded on almost the same terms and conditions and at the same time (see table 6).

As regards royalty and LSEP rates, the statistical analysis shows that there is no relationship between them in the Philippine study and in the India (I) and (III). But in the India (II), the value of the coefficient of correlation is not insignificant, - 0.27, whereas in the Portugese study it is +0.55. We can notice that in the Indian case all the coefficient of correlation are negative, which would indicate that when royalty payments go up, LSEP tends to go down (see table 4).

About firms with foreign equity participation, the Indian study shows that those firms generally have lower LSEPs. The weighted mean of such companies in India (I) is 18.82 against 19.85 for the general mean, and in

India (III) 30.01 against 34.00 (see table 7). The Indian report ask the question about taking into account - or not - dividends.

On the other hand, it is interesting to study relationship between LSEP and duration of contract. But the relationship is not obvious. LSEP does not vary much if the term is superior to five years (see table 8), because of the 'damping' effect of the discount factor.

4.3. Evaluating contracts

The research of fair technology payment would lead to establish that the LSEP rate should approximately range from 20% to 50%. But this must not be considered as a rigid and an absolute yardstick.

In fact, the delimitation of this space has to be carried out in each country, in each industrial sectors according to the economic situation of the branch concerned, its stage of development, the objectives of the government and the sectorial priorities established, and of course the level of the technologies involved.

Contracts not belonging to this space should require a scrutiny - or a closer scrutiny - of the registry and an in-depth study of the terms of the agreement.

In the Philippine study, for example, we can observe that some contracts with low royalty rates have in fact a high LSEP's. A close evaluation of royalty rate is recommended when low profitability is apparent.

It also shows that an evaluation only based on the examination of royalty rates may hide certain weaknesses in the proposed contractual arrangement.

Within the same context, one can state that high royalty rates may well be accepted for high-profit operations.

The UNIDO proposed method enables to calculate LSEP, even in case the licensee supplies no data or projections, by taking average profitability rate of the sector concerned - or a modified one if the technology is supposed to improve the profitability of the company.

When the registry gets the right information from the licensee, the advantages are numerous:

- The analysis is specific to the client (licensee) and his expectation of profit;
- Profit is clearly defined - it is a profit that is always reported in a company's balance sheet;

- The profit definition removes anomalies of tax treatment between industries in a country and between countries;
- It is possible to considerate the profit of various years (of the royalty-bearing period) which may involve profit variations, including negative profit;
- No data on sales volume is required;
- Because of clarity of definitions, computerization of data and calculation are possible.

4.4. Difficulties in evaluating contracts

When evaluation is made on the basis of information and projections from the licensee, the main difficulty consists of knowing to which extent such data are reliable. It appears necessary to take into consideration the capability of the licensee in making accurate forecasts, the period of the agreement - a long period renders projections more uncertain -, the product structure of the company - information is more difficult to obtain for a multi-product enterprise -, the novelty of the technology - forecasts are rather difficult to establish for new industries, or new products -, ...

Another difficulty for the registry lies in the necessity to be in a position which enable it to oblige disclosure about profit expectations.

One can also agree that profit structure undergoes wide fluctuation from one company to another - companies yielding the same products ...

The question of duration turns out to be very important. Normally, profit share should be calculated over the whole duration of the contract when the two parties are commonly engaged. But two considerations distort this state of things. Firstly, the life of the technology involved may go beyond the duration of the contract, and hence continue to contribute to the profit made by the recipient firm. Secondly, this is of particular importance when one takes into consideration that the initial period may produce a low profitability.

4.5. Monitoring contracts

Monitoring contracts is an important phase whose objectives are numerous.

As far as UNIDO method is concerned, first, LSEP and TTF rates collected regularly and computerized, enable the registry to monitor and

to assess its interventions and evaluations.

Furthermore, such an action will enable to collect sectoral data and establish guides of LSEP and TTF. It is in the end the basic condition for a widespread use of the method, i.e. the knowledge of current rates.

On the other hand, such a method can provide indications on the evolution - on the medium/long term - of TTF rates which are supposed to improve continuously over the contractual period, and indications on the ability of the companies - or the industrial sector as a whole - to master technology.

The study does not provide enough data for monitoring, however; it is possible to make a very broad study in the Indian case.

Making comparisons between different contracts shared into contracts based on historical data, and on projected data - but they are not the same -, one observes that LSEP on historical data is inferior to LSEP on projected data for the form ISIC sectors concerned and for one package of ISIC with two figures (see table 9).

In the Philippine case, where such an attempt has also been made, and for contracts with both historical and projected data, no general trend can be shown. (see table 10).

4.6. Difficulties in monitoring

The application of the method for monitoring purposes presents some difficulties.

The first one is the difficulty encountered by the registrar to collect the necessary information

The second one is to evaluate whether the information obtained is relevant. The studies have shown that profits may considerably vary from one year to the other, because it depends on many unquantifiable elements. Moreover, profits may be minimized in order to decrease tax payment.

CONCLUSION AND RECOMMENDATIONS

The concept of profit sharing as a tool for the negotiation, evaluation and monitoring technology transfer contracts can be regarded as very valuable in the establishment of a fair technology price.

With respect to the the contract negotiation, the licensee has a greater benefit while it can apply the method on the basis of information abstracted from any pre investment study. The licensor can only guess through its own use of the technology the potential benefit of the technology to be transferred and as such has less benefits from calculating LSEP.

The regulatory agency, on the other hand, when it can obtain the data from the licensor, has an excellent tool for checking the agreed technology fee despite the many limitations which have been extensively described in the various research papers on this subject. The principle of looking at technology fee, from a view point of profit share, brings the regulatory agency near to the licensee and can as such advise the licensee better.

The various research papers demonstrated that many factors will influence the technology price and that further research would be necessary before a set of guidelines could be published.

In this connection, it is recommended that UNIDO continues its efforts to provide for this basic set of guidelines and as such instructs a case study in close co-ordination with the TIES members Registries on the subject of technology pricing comparing the experience in one sector (for example tyre manufacture) in various countries.

Through this case study, a better country comparison would be possible and the conclusion reached in this summary paper would be put into a better perspective.

MEASURE OF LSEP

Table 4

ROYALTY	HIST. (3)	HIST.	PROJ. (5)	PROJ.	HIST. or PROJ.			
PROFIT	HIST.	AVER. IND. (4)	PROJ.	AVER. IND./FIRM or PROJ.	HIST. or PROJ.			
Numbers of Contracts	12	20	25	14	24	LSEP VARIATIONS	LSEP STANDARD DEVIATION	(6) (R. LSEP)
INDIA (I)	19.85 (1) 26.62 (2)					2% (7) / 60% (8)		- 0.08
INDIA (II)		30.08 37.10				0.66% / 62%		- 0.27
INDIA (III)			34.00 39.14			0.07% / 59%		- 0.04
PORTUGAL				33.27		12.2% / 70.6%	19.36	+ 0.55
PHILIPPINES					1.6 21.81	0.31% / 71.4%	15.7	- 0.007

- (1) Weighted mean
- (2) Arithmetic mean
- (3) Historical
- (4) Average rate in the industrial sector
- (5) Projected
- (6) Coefficient of correlation between royalty and LSEP
- (7) Minimum rate
- (8) Maximum rate

MEASURE OF TTF

Table 5

ROYALTY	(3) HIST.	HIST.	(5) PROJ.	PROJ.	HIST. or PROJ.		
PROFIT	HIST.	(4) AVER. IND.	PROJ.	AVER. IND./FIRM or PROJ.	HIST. or PROJ. or AVER.		
NUMBER OF CONTRACTS	12	20	25	14	24	TTF VARIATIONS	TTF STANDARD DEVIATION
INDIA (I)	4.44 (1) 7.78 (2)					0.64 (7) 48.63 (8)	
INDIA (II)		2.47 2.13				0.49 4.78	
INDIA (III)			2.45 2.06			0.65 12.76	
PORTUGAL				3.09		0.42 6.17	1.98
PHILIPPINES					4.1	0.4 195.68	

(1), (2), (3), (4), (5), (7) and (8) - *ibid.*, P. 16.

EXTRACT FROM INDIAN STUDY

Table 6

	LSEP	TTF
Evaporators and crystallizer plants	50%	0.97
Air circuit breakers	40%	1.49
Air circuit breakers	30%	2.23
Moulded case circuit breakers	24%	3.17
Moulded case circuit breakers	17%	4.78

FIRMS WITH EQUITY OF FOREIGN COLLABORATOR

Table 7

	ALL THE TABLE			
	(Except one w/only 3.23%	Number of contracts		Number of contracts
INDIA (I)	18.82 ⁽¹⁾ 13.69 ⁽²⁾	7	19.85 26.62	12
INDIA (III)	30.01 34.6	5	34.00 39.14	25

- (1) Weighted mean
- (2) Arithmetic mean

CONTRACTS WITH TERM > 5 YEARS

Table 8

	Contracts w/ term > 5yrs.	Number of Contracts	THE WHOLE TABLE	
INDIA (I)	19.30 ⁽¹⁾ 17.97 ⁽²⁾	5	19.85 26.62	12
INDIA (II)	30.90 38.38	8	30.08 37.10	25
PORTUGAL	⁽²⁾ 36.38	5	 32.27	14

- (1) Weighted mean
- (2) Arithmetic mean

LSEP
MONITORING (INDIA)

Table 9

(Comparison between different contracts
belonging to the same ISIC group, i.e. Contracts in HIST ≠ Contracts in PROJ.)

	HIST	PROJ		HIST	PROJ
3819	25%	29%	Σ 38 (1)	32.85%	38.5%
		28%	(2)	23.79%	33.97%
MEAN	25% 25%	28.5% (1) 28.31% (2)	Number of contracts	(8)	(22)
3851	20%	53%			
		52%			
		48%			
		30%			
MEAN	20% 20%	45.75% 48.26%			
3829	49%	60%			
	23%	50%			
	18%	48%			
		37%			
MEAN	30% 23.51%	48.75% 41.08%			
3831	41%	59%			
MEAN	41%	59%			

(1) Arithmetic mean

(2) Weighted mean

MONITORING (PHILIPPINES)
ON A FIVE-YEAR BASIS

Table 10

LSEF

	HIST	PROJ	Observations
Pharmaceuticals	28.9	24.9	Same contract
	0.31	1.7	Same contract
	31.3		
		23.4	
		18.5	
		18.2	
Consumer goods	21.1	9.8	Same contract
	4.2	22.6	Same contract
Food	39.8(*)	71.4	Same contract
	28.01		
		21.00	

(*) 4 years.



