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Challenges in Cross-border Technology Transfer for SMEs and Research Institutions in Biotech Sector

Krishnan S Raghavan, Ph.D.
Coordinator – Technology Transfer
Asian and Pacific Centre for Transfer of Technology (APCTT) of the
United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) in New Delhi, India

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Presentation Overview

- Key Challenges in Cross-border Technology Transfer
- Case Studies
- Concluding Remarks

Key Challenges in Cross-border Technology Transfer

- Barriers to the development and transfer of technologies exist at three layers (Global Climate Network, 2009):

✓**In practice,** where lack of skills to plan and implement TT projects and weaknesses in policies to direct technology flows can act as a barrier

✓**In principle**, where, historically, TT and trade have been linked in controversial debates split along developed-developing country lines

✓**In international climate law**, where, under Article 4.5 of the UNFCCC, developed nations have a legal obligation to promote, facilitate, and finance, as appropriate, the transfer of, and access to technologies and know how to developing countries

Key Challenges in Cross-border Technology Transfer

- At the "practice layer" the following specific barriers are evident:
  - ✓ **Lack of capacity at the user level to make a business case** for a TT project, search for available technologies, choose from among the candidate technologies, negotiate the terms of transfer, implement the TT project, use the transferred technology effectively, and improve operations through innovation.
  - ✓ **Absence of a coherent set of supportive policies** to induce critical technologies. The policy mix needs to explicitly prioritize preferred technologies and provide targeted financial and fiscal incentives.

Key Challenges in Cross-border Technology Transfer

- At the other two layers specific barriers that have attracted attention are due to intellectual property and finance:

  - ✓ **Intellectual property (IP)** is at the core of innovation but it is also accepted that it can be a barrier for both horizontal and vertical technology transfer.

  - ✓ Many studies have suggested that **lack of access to finance** is a major barrier to technology development, and deployment. This is exacerbated by the fact that commercially useful technologies require high up-front investment when compared to other technologies

Case Study – Technology Valuation

- A business firm AB based in an Asian Country X is interested in setting up an onion oil extraction plant.
- Firm AB requested APCTT to identify the technology provider and informed that they had adequate land for setting up the plant on a turn-key basis
- Through APCTT's efforts, a business firm CD based in another Asian Country Y was identified as a potential technology transferor.

Case Study – Technology Valuation

Firm CD offered to transfer onion oil extraction technology under the following terms:

- All machinery needed to set up a production line (crusher, filter, vaporizer etc.), with a processing capacity of 10 tons of onion per day to extract onion oil, would be supplied on a turn-key basis.
- The cost of providing the machinery and commissioning it in Firm AB’s factory would be US$ 430,000
- In addition, an annual fixed technology transferee fee of US$ 43,000 should be paid for a period of 20 years.

Case Study – Technology Valuation

Outcome

Firm AB was reluctant to consider this offer from Firm CD stating that the **annual fixed technology transfer fee was very high** and over a period of 20 years the total payment would be double that of the cost of setting up the production plant. Attempts to get Firm AB to do some analysis and negotiate with Firm CD were not successful.

Case Study – Technology Valuation

1. Do you think that the prices quoted by Firm CD are high? If you were Firm AB would you consider this offer?

2. What type of analysis would you carry out to decide whether the cost of the technology is reasonable or not? What additional information would you need to do this analysis?

3. What additional information would you ask from Firm CD to supplement your analysis?

Case Study – Technology Valuation

Basic data:

Processing capacity	=	10 tons/day
Cost of plant	=	US$ 430,000
Technology Transfer (TT) Fee per year	=	US$ 43,000
Period of TT payment	=	20 years

Case Study – Technology Valuation

***Some Basic Assumptions:* (Costs are based on the Indian setting)**

Yield (0.5% of onion oil per ton of onion)	**=**	**0.005 tons (5 kg)**
Land, building and factory construction costs	**=**	**US$ 500,000**
Average salary per shopfloor worker	**=**	**US$ 150 per month**
Average salary per technical/managerial staff	**=**	**US$ 400 per month**
Utility cost (electricity)	**=**	**US$ 3,000 per month**
Cost per ton of onion	**=**	**US$ 40 per ton**
Working days per month	**=**	**25**
Depreciation rate for the building	**=**	**05%**
Depreciation rate for plant and machinery	**=**	**10%**

Case Study – Technology Valuation

Some preliminary calculations:

- **Annual raw material usage = 10 x 25 x 12 = 3,000 tons**
- **At a yield of 0.5%, the total oil extracted per year = 15,000 kg**
- **Total annual shopfloor labour cost= US$1,500 x 12 = US$ 18,000**
- **Total annual technical/managerial cost= US$ 1,200 X 12 = US$ 14,400**
- **Total annual raw material cost= US$ 40 x 3,000 = US$ 120,000**
- **Annual utility costs= US$ 3,000 x 12 = US$ 36,000**

Case Study – Technology Valuation

<u>Cost of production (in US$) per annum:</u>

• Materials	=	120,000
• Shopfloor labour	=	18,000
• Technical staff	=	14,400
• Utilities	=	36,000
• Depreciation (plant and machinery)	=	43,000
• Depreciation (buildings)	=	25,000
• TT fees	=	43,000
Total	**=**	**299,400**

- This can be rounded off to US$ 300,000. Thus the total cost of production per year is US$ 300,000
- The production **cost per kg of onion oil** = 300,000/15,000 = **US$ 20**

Case Study – Technology Valuation

- If the selling price per kg of onion oil is less than US$ 20 then the valuation is too high based on the Indian cost setting

- If the selling price per kg of onion oil is US$ 30, then the profit before tax (PBT)=(US$ 30 – US$ 20) x 15,000 = US$ 150,000

The question is whether this is a reasonable return?

- If the seller did not charge a TT fee of US$ 43,000 then PBT would have been US$ 193,000

- Thus what the seller is doing is taking US$ 43,000 out of the US$ 193,000 leaving the buyer with US$ 150,000

- The profit share (PS) being extracted by the seller is = US$ 43,000 / US$ 193,000 = 0.2228 = 22.28 %

- Thus based on the seller's technology, the buyer is making a profit of which the seller is taking 22.28%.

Making a Business Case

The key issue is whether this Profit Sharing is acceptable to the buyer. It must not be forgotten that any TT transaction is a business deal where both buyer and seller should work towards a "win-win" situation

Case Study – Technology Valuation

Need for Sensitivity Analysis

- Let us assume that the buyer accepts that a Profit Sharing of 22.28% is reasonable and agrees to go for the arrangement.

- It must be remembered that the business case has been made on the basis of many assumptions. These assumptions could prove to be incorrect with time.

Case Study – Technology Valuation

- Is the yield of 0.5% realistic? What if it is only 0.1% or lower? The whole project will fall apart if this happens. Can onion oil prices go down?

- Can the seller give a guarantee that the yield will be consistent at around 0.5%? Can this be certified by a recognized agency? Can we build a penalty clause into the agreement if the technology does not give the desired yield?

- The oil extracted will depend on the quality of the onions. If the onions have too much water then the yield will be lower. How can this be prevented? We need to consult with agronomy experts.

- Even if the yield is good and the water content can be controlled, what if labour costs, utility costs, and raw material costs go up? Can we pass on these costs to the buyers of onion oil? Is the onion oil market a perfect or imperfect market? Are there many producers of onion oil?

Case Study – Technology Valuation

Decision Making

- **The buyer could tell the seller that a period of 20 years TT fee payment for a technology is too long since technology changes rapidly. A 10 year payment could be negotiated with an understanding that the seller will upgrade the plant at the end of 10 years with the latest technology after which a further 10 year payment can be considered.**

- **A major conclusion is that technology valuation can only be based on a good understanding of the business setting and a robust business case must be prepared based on realistic assumptions and a good sensitivity analysis.**

Case Study – IPR

- An academic institution in the United States of America has been involved in the development of transgenic papaya resistant to ring spot virus.

- In 1999, a researcher from India visited the academic institution in the United States as part of a fellowship and during course of his research the famous transgenic papaya resistant to PRSV (Hawaii strain) was developed.

- The transgenic line carrying the gene was patented later with the USPTO and subsequently with the WIPO. Given the contribution of the Indian researcher in the invention, the American institute acknowledged his name as part of the patent application.

- This patent was however connected to another patent by the team leader which involved the development of a gene construct for developing the transgenic papaya.

Case Study – IPR

- **Subsequently, the Indian researcher returned to India, and wished to develop a similar technology using Indian papaya varieties. He requested for the use of the gene constructs developed by the American institute.**

- **The Team leader, who was also the director for the academic institute's Papaya Research Program provided the constructs under a material transfer agreement (MTA) for a period of three years i.e. 2001 to 2004 with the condition that the material was to be exclusively used by the researcher, for research and academic purposes and any commercial property developed using this material would be linked to the inventor's patent.**

Case Study – IPR

- **In India, the researcher and his Indian employer were involved in the initial phases of experimentation and were able to successfully develop a transgenic line using the construct's backbone and gene from Indian virus isolate.**

- **However, the process was completed in late 2004 by which time the MTA had lapsed. The researcher requested for an extension of the MTA agreement.**

- **Since the researcher was optimistic about developing a commercial product using this construct, he wanted to know whether he could patent this by linking the invention to the team leader’s first patent.**

Case Study – IPR

- **Meanwhile, significant changes had occurred in the American institute's Intellectual Property arrangements and the team leader had left the institute to join US Department of Agriculture (USDA).**

- **However, the American institute continued to receive grants from the first two patents filed by the team leader and it rejected the application from the Indian researcher and claimed that any commercial products developed hereafter would be a patent infringement and would lead to legal action.**

- **The Indian researcher's project had to be put on-hold and all plants developed using the construct were destroyed in the incinerator.**

Case Study – IPR

Questions for Discussion

1. In your opinion what were the major mistakes committed by the researcher in the issue related to intellectual property rights.

2. What measures would you suggest to avoid the kind of problems that were faced by the researcher in this case study?

Concluding Remarks

- **Cross-border** technology transfer is critical for countries in the Asia-Pacific region to achieve SDGs

- In the Biotech sector, cross-border technology transfer face additional barriers such as **need for traceability, biosafety and diverse quality standards and compliance procedures**

- Being a Regional Institution of United Nations with a specific mandate to promote technology transfer, APCTT strives to be an enabling platform for **cross-border knowledge transfer, regional networking and capacity building**

- APCTT promotes **South-South, North-South as well as Triangular cooperation** modalities for supporting countries in technology-driven sustainable and inclusive development

Thank you

Reach us at

Asian and Pacific Centre for Transfer of Technology (APCTT)

United Nations ESCAP

C-2, Qutab Institutional Area, New Delhi – 110 016, India

Tel : 91-11-3097-3758 | Fax : 91-11-26856274

Email : **srinivasaraghavan@un.org** | Website : www.apctt.org

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