

54166

IDRC-171e

# Absorption and diffusion of imported technology

Proceedings of a workshop  
held in Singapore,  
26-30 January 1981

**ARC HIV**  
**54166**

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

© International Development Research Centre 1983  
Postal Address: Box 8500, Ottawa, Canada K1G 3H9  
Head Office: 60 Queen Street, Ottawa

IDRC, Ottawa CA

IDRC-171e

Absorption and Diffusion of Imported Technology : proceedings of a workshop held in Singapore, 26-30 January 1981. Ottawa, Ont., IDRC, 1983. 112 p. : ill.

/Science policy/, /technology transfer/, /choice of technology/,  
/technological change/, /South Asia/, /Indonesia/, /Korea R./,  
/Philippines/ — /small-scale industry/, /textile industry/, /self-reliance/,  
/employment opportunities/, /foreign investments/, /case studies/,  
/comparative analysis/, /list of participants/.

UDC: 62.001.1

ISBN: 0-88936-298-X

Microfiche edition available

# **Absorption and Diffusion of Imported Technology**

**Proceedings of a workshop held in  
Singapore, 26-30 January 1981**



ADP  
601 22  
C I  
1081

## **Contents**

**Foreword 5**

**Introduction 7**

**ADIT: A Review 13**

### **Case Studies**

Accumulation of technological capability and assimilation of imported industrial production systems in the cotton textile industry in Bangladesh  
**Quazi H. Ahmed 21**

Absorption and diffusion of imported technology: a case study of four industries in Sri Lanka  
**Marga Institute 28**

Some issues pertaining to technical change in the cotton textile sector in Sri Lanka  
**W.D. Lakshman 37**

Absorption, assimilation, and diffusion of imported technology in Pakistan: a case study of the textile and pharmaceutical industries  
**Firasat Ali and Jamal Ahad Khan 41**

Technological change, transfer, and diffusion in the textile industry in India  
**Amitav Rath 49**

Technology and market structure under government regulation: a case study of the Indian textile industry  
**Ashok V. Desai 61**

The Philippine ADIT project: a summary paper  
**Luke Kho and Lope Cuaresma 73**

Absorption and diffusion of imported technology: a case study in the Republic of Korea  
**Woo Hee Park 79**

Analysis of systems behaviour in the absorption and diffusion of imported technology  
**Suck-chul Yoon 90**

### **Comparative Studies**

Similarities and differences: the Indonesian case  
**Nilyardi Kahar 95**

Japanese investments in South Asia from a global perspective	
W.D. Lakshman	97
Comparative analysis of technology policies of ADIT network countries	
Quazi H. Ahmed	105
Workshop Conclusions	109
Participants	112

# The Philippine ADIT Project: A Summary Paper

Luke Kho<sup>1</sup> and Lope Cuaresma<sup>2</sup>

Initial efforts in this study were spent trying to operationalize the key concepts developed in the Science Policy Research Unit/International Development Research Centre workshop. Researchers attempted to relate "technology" and "techniques" and sought answers to such questions as: What is involved in each of the processes of absorption, assimilation, and diffusion? Where do they begin and end? How do we compare levels of absorption, assimilation, and technical capability between two companies? How do we actually measure them? What information must be known?

It later became apparent that these and other questions could not be settled satisfactorily without sufficient empirical data. Consequently, it was decided to interview textile experts and millers in an effort to elicit ideas that might be useful. The questions asked were related to conceptualization of absorption, assimilation, and diffusion. Unfortunately, in the initial interviews, the researchers could only glean general information about the state of the industry; little helpful technology-related information was acquired.

In the process of gathering background information/statistics about the textile industry, it was realized that the industry is concerned with problematic aspects that, in the opinion of the individuals, were not related to technology. Some of the problems, for example, involved where to get money for day-to-day operations; how to discipline workers to increase productivity, upgrade quality, and minimize wastage; logistics related to the supply of raw materials and spare parts; and how to expand the textile market. Some millers, when interviewed, agreed that technological issues are secondary to the

above problems, while admitting that technological change can effect a general improvement in the industry's performance. Capital, which the industry generally lacks, is needed for inducing technological change. Moreover, even if technological progress is made, there is still the question of: Would the market be able to absorb the increase in production or the higher quality products, even at lower production costs, and, thus, lower prices?

The need to deviate, though not totally, from the original research objectives, which touched mostly on technological development, processes (absorption, assimilation, and diffusion and measuring the levels of each; workings of technology transfer), and the factors/variables, was observed. It was realized that if the study were limited to technological aspects, for which there was insufficient information to work with, it might not have provided a useful base for analysis. To come up with a more meaningful study, therefore, aspects considered important by millers and textile industry experts were studied. Furthermore, the technology concepts and definitions set before the start of the absorption and diffusion of imported technology (ADIT) study were not used as originally intended.

Nevertheless, as technology was still of primary importance, an interview outline dealing mainly with technology topics was used in gathering information for the case studies. It was hoped that technology-related (and other) information could be obtained from individual companies and used to answer some technological questions. It was also hoped that the information collected would allow comparisons of one mill with another to be made.

Unfortunately, the interview outline was not followed rigorously. The interviewees were either reluctant to answer most of the questions or impatient with the interview; others appeared disinterested. Most of the questions, therefore, were not answered. The interviewees generally

<sup>1</sup>Research Supervisor, Research and Statistics Division, National Science Development Board, Metro Manila, Philippines.

<sup>2</sup>National Science Development Board, Metro Manila, Philippines.

discussed topics (nontechnological) that they considered more significant. Such digressions were interesting and much was learned about the industry from them. The result, however, was that it was not possible to gather parallel or similar information for the case studies. In addition, the information collected was incomplete, thereby allowing little or no analysis of it to be made. Also, the researchers found it difficult to conduct follow-up interviews, and much of the background information was considered confidential, nonexistent, or "sorry we could not find it."

Interviews were conducted with knowledgeable officials of government agencies (e.g., Philippine Textile Research Institute) and industrial organizations (e.g., Textile Mills' Association of the Philippines). The topics discussed in the interviews were of a general nature.

The researchers were also concerned about the sampling scheme used. Originally, firms were chosen at random, using statistical procedures. However, all of the firms, except one, proved so uncooperative that replacements had to be found. It turned out that the actual sample firms were those that cooperated with the study to a certain extent, a fact that could have a biased effect on the results of the interview.

Furthermore, although the study deals with the entire textile industry, only a list of integrated mills was used as the basis for sampling for the case studies. The decision to have this type of mill serve as the framework was reached after taking into consideration the following factors: (1) the firms' contributions to the Philippine economy (most of them belong to the top 1000 corporations in the Philippines); (2) the availability of data for the case studies; and (3) demonstration by these firms of the three basic processes (spinning, weaving, and finishing) in textile manufacturing.

Thus, the researchers encountered difficulties and were actually limited in their analysis. It is believed, however, that the data and information gathered, the analysis of it, and the results of the study still provide useful information about the textile industry in the Philippines and its problems and prospects.

## **Major Findings and Policy Implications**

### **Machinery and Equipment**

#### **Need for Modernization**

The existence of obsolete and inadequate equipment and machinery (most of which is of

late 1960s vintage) contributes to the noncompetitive quality and price of local textile products. As a result, fabrics with uneven yarns, weaving faults, and poorly executed prints saturate the market at low prices only to be dislodged from the market by the intermittent appearance of cheaply priced, imported, mostly smuggled textiles. Only with newly installed mills that utilize modern machinery and more advanced technology can the textile industry produce highly competitive and exportable goods.

To modernize the equipment would require huge amounts of capital. The governments of some countries, such as Taiwan and Korea, have encouraged their textile industries to modernize by making available short- and long-term loans at low interest rates. In the Philippines, on the other hand, the textile industry is left to fend for itself, needing an estimated U.S.\$100 million to modernize. Under existing conditions, however, the industry is not in a position to undertake a program of expansion and modernization, constrained as it is with a severe financial problem.

In this regard, the government could follow the Taiwanese and Korean example of modernization, i.e., encourage replacement or modification of obsolete techniques and processes of production through financial assistance (e.g., loans at lower interest rates), particularly to mills that export their products.

Preventive maintenance of machinery and equipment is another dimension to consider in relation to the modernization and updating of "embodied" technology. Researchers have found that a substantial quantity of equipment remains idle due to a lack of spare parts or due to improper scheduling of their purchase. Moreover, poor quality locally made spare parts, as well as a lack of technology "follow-through," contributes to problems with equipment and machinery. Centralized planning (e.g., by textile mills associations) for the procurement of spare parts and technology upgrading might be an interesting alternative to study.

#### **Selection of Technology Suppliers**

Inasmuch as the decision-making process for the acquisition of equipment and machinery is a major component of technology transfer, the choice of alternatives must be broadened to include all possible sources to enable millers to acquire the most competitive technology from among those having the latest state of the art in the industry. It was found that most decisions to purchase equipment from a certain supplier followed the bandwagon effect.

Government, as well as any international information clearing house, can remedy de-

iciencies in information about other possible suppliers by undertaking on its own, or with the cooperation of prospective buyers of technology, economic and technical studies on different suppliers of textile equipment and machinery. International trade shows could be more widely publicized and prospective textile businessmen should be encouraged to attend. Thus, government financing institutions such as the Development Bank of the Philippines and the Central Bank, as well as policymaking bodies such as the Board of Investments, should take a more active interest in international sources of technology transfer.

## **Labour**

Being a labour-intensive industry, the textile industry is persistently plagued by labour discontent and other labour problems. In general, Philippine labour productivity in the textile business has been very low compared with Japan and the United States.

Productivity will improve if modern machinery is installed. In addition, better training facilities for skilled workers are needed. Labour productivity will also improve if workers are not pampered by decisions on labour cases tending to favour the labour sector. Then, abusive and erring workers could be disciplined in a fair manner.

Labour turnover in the industry is very fast, with some of the workers transferring to other textile factories, some to other more promising industries, and many of the skilled labourers going to the Middle East. An estimated 5000 skilled labourers need to be replaced every year for the entire industry. These replacements also require training. The aspect of continually training labour for the textile industry is a matter that requires strengthening by the government and the private sector.

## **Noncompetitiveness of Philippine Textile Exports**

Exportation in the textile industry can be classified into fibres and yarns, grey goods, finished fabrics, garments, and ready-to-wear articles. The export of fabrics and garments from the Philippines should be given high priority, due to their labour-intensive and high value-added nature, by upgrading their quality, thus making them competitive in the international market.

The local textile industry was started as an import-substitute industry. The machinery acquired then, and which is currently in operation, was designed to produce fabrics of 36 in. (0.91 m)

width. At present, foreign markets prefer fabrics of 45–60 in. (1.14–1.52 m) width, thus making the local products unacceptable. Moreover, the local equipment and textile processing techniques are outdated, in addition to the problem of high turnover and low productivity of labour.

Thus, in addition to encouraging equipment modernization and continuous training of textile workers, the government can assist in quality upgrading by monitoring quality through on-the-spot checks and laboratory testing of textile and garment products and penalizing erring manufacturers. Although the government has recently established rules/guidelines on labeling of textile products, the system of checking and testing products has yet to be set up.

## **Entry of Imported Textiles**

Local garment markets complain that the quality of locally produced textiles is still below that of products produced in other countries. In view of this, garment makers resort to importation of higher quality textiles.

Furthermore, because the Philippine market is volatile in its preference for changing fashions and colours, foreign products seem to gain market acceptance in the Philippines, thus contributing to rampant illegal entry of foreign textile products. Illegal entry is gained in two ways: outright smuggling and "technical smuggling," which invokes the provisions of Republic Act 3137, the "Embroidery Law," that allows the entry of embroidery materials, misdeclared and undervalued.

Due to the entry of imported textiles, therefore, the market for the local industry has been reduced considerably. Evidently, this problem calls for a renewed drive against illegal entry and sale of foreign-made textiles, although in the past years, smuggling has not been as rampant and problematic as in the 1960s.

## **Raw Materials**

The problem of irregular supply of materials for the synthetic textile industry has been partially alleviated by the establishment of synthetic-fibre manufacturers. The local production of raw cotton and rayon is not enough to supply the needs of the textile manufacturers, thus making the industry dependent upon foreign sources and, in turn, leaving it vulnerable to price inflation, peso to dollar exchange rate fluctuations and foreign logistics supply problems, and, most of all, the monitoring of quality.

Millers complain that the quality of cotton fibres shipped to them is of lower grade than what



they specifically ordered. In addition, the importation of cotton entails high cost. Mills pay 10% duty plus 10% sales tax. Because the tax is computed on a 25% markup of the landed cost of raw materials, local millers are at a disadvantage compared with millers in Hong Kong, Korea, and Taiwan who do not pay taxes on cotton imports.

If imported raw materials are exported as finished goods, the local millers are refunded the taxes they have paid. However, according to the head of the Textile Mills Association of the Philippines: "You can get your refund from six months to one year from the time you paid the duties and taxes. All the while, the money tied up is not earning any interest; if it is borrowed from the banks, the interest naturally accrues."

The high price of imported cotton, polyester, nylon, rayon, and acrylic materials is also reportedly due to the small-sized orders being placed by local millers. Locally produced nylon and polyester, which can meet only 50% of the local demand, generally cost more than imported nylon and polyester. The importers of nylon and polyester yarns, therefore, have some difficulties because of the protection that the government accords local producers.

### **Domestic Fluctuations due to Changes in Fashion**

Due to a highly volatile market preference for fashionable designs and colours, the textile industry, being a supplier to the garment makers, faces the problem of demand and supply uncertainties brought about by market forces over which it has little or no control. Thus, the textile manufacturers cannot expect a smooth movement of inventory and, consequently, a predictable cash flow. Moreover, because garment manufacturers and yarn suppliers are distinct organizations, the building up of inventories by garment makers and distributors cannot be controlled or checked by the millers, thus making the lean period following the buildup unpredictable.

### **Financial/Cash-Flow Problems**

High interest rates plague the textile industry. Local rates range from 14–16%. In comparison, rates in Hong Kong, Korea, and Taiwan do not exceed 8%.

Most of the textile mills are heavily indebted to certain government and private financial institutions. Still, there are cash-flow difficulties, despite the fact that the above-mentioned debts can be attributed to the increased peso cost of

imported raw materials, supplies, and spare parts and also the amortization on existing foreign obligations, the increase in minimum wages for skilled labour, unpredictable fluctuations in inventory and sales, and the high cost of capital. It should be noted that the tight cash-flow situation is so serious and unpredictable that some textile company officials find it convenient to buy into commercial banks and sit on the board as directors.

### **Capacity Utilization**

The relatively low utilization rate of installed capacity is partly due to: (1) difficulty in securing imported spare parts causes many machines to remain idle; some mills have failed to reach a proper balance between the cost of lost production when machinery lies idle due to a lack of spare parts and the capital cost of stocking spare parts; (2) delays in the delivery of imported raw materials forces some millers to stop operations; (3) demand for many fabric styles and designs causes production lags in various product lines; (4) imbalance among installed capacities: weaving and knitting capacities far exceed spinning capacity so that millers still import part of their yarn requirements; and (5) competition from imported fabrics results in a reduced market for local textiles.

### **Integration of Mills**

Some industry experts express regrets on the past movement toward integration. Most integrated mills have been experiencing problems that arose as a result of undertaking spinning, knitting and/or weaving, and finishing operations all at the same time.

Older mills do not have the ideal functional layout patterns of the newly installed mills, the reason being that, as the old mills integrated, additional equipment was squeezed into existing buildings or additional structures were erected with a view toward minimizing capital costs at the expense of operating efficiency.

Quality has also suffered due to integration because tolerance levels between spinning, knitting and/or weaving, and finishing departments in an integrated mill are much lower than those in companies specializing in one or two operations.

Lastly, management of a large integrated mill has caused problems due to the diversity of the operation. Although the integration of mills would be very difficult or even impossible to reverse, the experiences of integrated mills should be noted by nonintegrated mills that plan to diversify into other textile operations.

## Poor Management Practices

The poor quality of locally produced textiles is also due, in part, to: (1) buying cheap raw materials that become more expensive in the long run due to difficulties in processing; (2) lack of capital, which means that equipment replacement cannot be undertaken without borrowing more capital; (3) insufficient programs dealing with spare parts acquisition, raw material purchases, maintenance, equipment replacement, and personnel training; (4) failure to decide what products to manufacture and how to market them; (5) failure to realize that vertical integration introduces more management difficulties; and (6) keeping information from staff (e.g., on costs), thus preventing staff from supporting or advising management.

It is obvious from the above that the problem of absorption and diffusion of imported technology in the Philippine textile industry is a combination and interrelation of multidimensional factors. One can trace the entire problem, however, to stiff competition in domestic and international markets driving profitability, as well as cash flow, to the bottom line. As a result, the Philippine textile industry, with the exception of a few companies, is plagued by problems of low profitability, low productive efficiency, and poor quality output. These problems have definitely contributed to the noncompetitiveness of Philippine textile products in the international market, and, thus, discouraged new investors, as well as talented management experts, from entering into the industry. On the other hand, these conditions are ideal for technological change, accompanied by a management breakthrough in corporate planning and organization, as well as framing up of appropriate fiscal policies hand in hand with the government. One possibility is the removal of tariff protection from imported textiles. Government support is needed in the area of lowering tariffs on the importation of raw materials and a ban/limitation on imported textiles or garments. The removal of incentives is aimed at improving the competitiveness of the industry. The government hopes that inefficient plants either improve or phase out of

the market. Furthermore, with the lifting of the tariff protection, the government hopes that textile prices will fall because textiles are a basic consumer need and an essential raw material for the growing local garment industry.

It should be noted that the above policies, if implemented, mark a shift from past government policy of support and protection stimuli and competition. The preference given to the development of the local garment industry, which is labour intensive and export oriented, seems to indicate the growing dissatisfaction of government funding agencies with the results of its support in implementing "technical change" for the textile industry in the form of equipment purchase. It is hoped that the shift of attention to the garment industry may result in simultaneous stimulation of quality output for the textile industry.

Finally, closer cooperation between the government and the industrial sector is in order. No amount of government willingness to assist can improve the industry if the private entrepreneurs do not work with the government. Private millers should contribute financially or otherwise in efforts to improve the industry's performance and capability. They should cooperate in government surveys and other studies (such as the ADIT project) that are useful to policymakers and industry planners. Many private businessmen are reluctant to provide information required by government studies despite penalties for non-cooperation. Moreover, private companies should implement their own policies and measures to upgrade their individual performances in areas where the government cannot help, e.g., poor management practices and work discipline.

## Conclusion

Although this study does not lend itself to forming general conclusions and propositions regarding the textile industry in the Philippines, it has revealed the turbulent and dynamic nature of the interactions between industry variables and the external environment.

---

### Comments: W.D. Lakshman

*These comments refer to the comprehensive report prepared by the research team from the Philippines.*

*One of the objectives of international network research of the ADIT type is to develop some comparative perspectives on the research topic.*

*The Philippines study, however, is an illustration of the difficulties involved in achieving this objective. The main difficulties encountered by the research team are concerned with obtaining relevant data. Although the study started with the objective of examining technological development, i.e., absorption, diffusion, and assimilation of technology, within the textile industry of*

the Philippines, it was necessary, because of data limitations and the uncooperative attitudes of the firms interviewed, to deviate from the technology concepts and definitions agreed upon by the research teams in the network.

Little harm is done, however, by not adopting a particular set of definitions — after all, any set of definitions in this area would be arbitrary — but some definitions and a clear conceptual framework are required to undertake a useful study. In this regard, the research team does not seem to have evolved an alternative set of definitions. In fact, in their attempt to study all the aspects of the textile industry considered important by millers and industry experts, they have produced a useful source book, subject to limitations, of course, about the textile industry in the Philippines but whose place in the present research network is difficult to understand.

It is pointed out that, in the mind of those in the industry, the problems facing the textile sector in the Philippines are not technologically related. This position, however, does not seem to have been accepted by the authors of the study. The position that the problems of the industry are not technological is interesting because technology seems to have been viewed in a rather narrow sense. Some of the issues the industry seems to consider crucial, e.g., how to upgrade quality and minimize wastage, cannot be dismissed as non-technological problems. Undertaking a study of the textile industry that will be considered useful by industrialists has one advantage, it makes implementation of its recommendations easy at the firm level. It could be said that if this was done while remaining broadly within some agreed upon framework, the study would have been more useful within the present comparative network research.

The study begins with a chapter dealing with some overall magnitudes of the textile industry in the Philippines. The data used are obtained mainly from two sources, referred to by the authors as the BOI and MI-CB preliminary reports. The chapter examines the historical growth and present position of the industry. There is also an examination of the responses of textile engineering graduates within the country to a questionnaire administered by the researchers, although the exact relevance and purpose of the exercise is not clear.

The rest of the report is based on nine case

studies: four textile-manufacturing companies and five synthetic-fibre manufacturers. The section on methodology in the abstract presented for discussion explains the basis for the selection of these firms for study and the possible biases that could have entered into study findings as a result of not being able to adopt a proper sampling method for choosing firms for intensive study. It would have been useful if the relative position of the firms studied, within the country's textile sector, was statistically indicated. It should be noted that in terms of the number of textile firms within the Philippines, the chosen sample of nine constitutes about 5% of the total. Because the chosen firms are relatively large, in terms of size indicators such as production or employment, their share in the total industry would be higher than 5%.

The report goes on to examine the history, present performance, and problems of each of the nine firms. These descriptive accounts are often devoid of any statistical analysis, except for the data one normally finds in financial statements. I am sure a lot of effort would have gone into collecting this information, particularly when one considers the tremendous hostility the researchers seem to have faced during their interviews. If the data, so laboriously collected, were analyzed with the proper perspective to achieve a set of predetermined research objectives, the usefulness of the study could have been greatly enhanced. The first case study on Ramie Textiles Inc., based, apparently, on the findings of another research thesis, in addition to the present research team's survey, is very interesting. In the descriptive style adopted throughout, the authors discuss various technological challenges faced by this firm from time to time and how it found, essentially through its own efforts, suitable solutions to these problems.

The authors do not attempt to produce a synthesis of the individual case studies but, with qualifications about the validity of generalizing on the basis of the limited number of cases studied, try to present their findings in a summary and conclusions chapter. The focus is on the general problems of the textile sector in the Philippines. Some effort to focus more specifically and directly on problems of technological change and development in the textile sector would go a long way toward making the content of the study more agreeable with its title.