Chapter VI

TECHNOLOGICAL CHANGE AND THE FORMS OF PRODUCTION ORGANISATION: A CASE STUDY OF HANDLOOM AND CONCH SHELL PRODUCT INDUSTRIES

In the Marxian tradition it is held that capitalist entrepreneurs are instrumental in bringing about technological innovations and the adoption of new technology. We have noted in Chapter 1 that Marx visualised technological dynamism as directly associated with the development of capitalist institutions. According to Marx, "The bourgeoisie can not exist without constantly revolutionising the instruments of production, and thereby the relations of production, and with them the whole relations of society."  

As regards the role of the merchant class Marx observed that the merchant capital, in its early stage had a purely external relationship to the mode of production, i.e. the 'mode of production remained independent and untouched by Capital'. The merchant was merely 'the man who removes goods produced by the guilds or peasants' in order to gain from the price differences between different productive areas. In the later phase, the merchant capital began to establish control over the process of production, partly in order to exploit the latter more effectively - to "deteriorate the condition of the direct producers ... and absorb their surplus labour on the basis of the old mode of production" - partly in order to transform it in the interests of greater profit and the service of wider markets. In other words, the merchants prefer to maintain their traditional method of profit-making, and even oppose any change in technology that may unleash new forces of production. It is also believed that the unleashed forces of production, resulting from new technology, would contradict the existing relations of production, particularly when these were based on pre-capitalist organisations, and modify the latter. In other words, the dialectical process is such that the pre-capitalist organisations cannot accommodate a major change in technology - the logical conflict that would arise between the new

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1 Marx and Engels, 1848, Vol.1, p.36. The rate of profit could be raised (or prevented from falling) "by reducing the value of the constant capital required by commodity production" (Marx, 1986a, p.60).

2 See Dobb (1963), p.123. Marx also stated, "The independent and predominant development of capital as merchant's capital is tantamount to the non-subjection of production to capital developing on the basis of an alien social mode of production which is also independent of it" (1986c, pp.327-28).

3 Marx, (1986c), P.335; Dobb cited the two roads to capitalist transition as described by Marx: (1) 'the [independent] producer becomes merchant and capitalist' [through the process of accumulation and differentiation] which Marx called 'the really revolutionary way'; (2) merchants 'take possession in a direct way of production' - as way which though it 'serves historically as a mode of transition', nevertheless by itself cannot do much to overthrow the old mode of production; but rather preserves it and uses it as its premise; and eventually becomes an obstacle to a real capitalist mode of production (Dobb, 1967, p.12).
forces of production and the existing organisation would result in the decline of the latter and in its place new form of production organisation would emerge.

Contrary to the above mentioned, the present chapter would try to show that there exist certain conditions under which the merchants play a leading role in adopting improved technology and/or bringing about product improvement. This has taken place, we shall argue, well within the existing pre-capitalist production relations and in a manner that the new technology has strengthened the existing pre-capitalist production organisations. As opposed to the merchant class, the capitalist entrepreneurs have remained either indifferent or have gradually withdrawn as the technological dynamism has set in. The field data collected in selected industrial clusters would be the basis for this discussion.

One important feature of the recent changes in the handloom industry is that the clusters in which merchants were predominant and were operating with the petty producers through putting-out system a significant improvement in the production system was witnessed. By sharp contrast, the cluster predominated by the capitalist producers failed to respond to technological development resulting in its further decline. Of the industries considered here, the conch shell industry has the unique characteristic of having two forms of organisations, viz, the community system and the merchant-dominated putting-out system. In the cluster where only the latter system prevails, there have been both product and process innovations, whereas in the cluster predominated by the former there has been only process innovation.

This chapter would try to explore the reasons for the variations in adoption of technology across clusters in each industry. We would try to explain these variations in terms of the variations of the factors which are (i) internal to the clusters, like, the mode of operations of the merchants, capitalist producers and the community system, and (ii) external to the cluster, like, migration of skilled labourers and assistance from cooperatives. The case study would also try to find out the conditions

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4 In order to organise production a number of families (or some of their members) often attached through kinship, neighbourhood, etc., belonging to a particular caste, form a group (though not in the formal sense). Within a group there exists division of labour as the different segments of the production process require different types of skills. Members of the group share limited work opportunities, raw materials, and other resources. The community organisation need not exist in its pure form, i.e., common ownership of property, but individual ownership and initiatives are found. For further detail see below.

5 We may mention here that term 'process innovation' is used here to mean development/use of new method of production which may involve new tools, equipments or machinery for production. Process innovation may or may not be associated with 'product innovation'. The term product innovation is used to mean changes in the quality of the product, or of its appearance without intrinsic change (e.g. new brand) and new products for new use. And technological innovation implies either the product innovation or process innovation or both.
under which the merchants actively participate in technology development whereas the capitalist producers do not. The improvements in the production technology, we would argue, have been caused by factors both internal and external to the industries that are considered here. In section I we would provide a brief description of the clusters, variations in technology as existing at present, and the pattern of changes over the last two decades, across clusters. We would also try to provide some implications of technological change on income and employment. Section II would try to explain the variations of the clusters in responding to technological changes, in terms of the organisational form predominant in each cluster. In other words the behaviour of the merchant, capitalist producer and the community system would be highlighted. It is observed that the cooperatives played the pioneering role in introducing new technology, the advantages of which have been taken by the merchant-dominated putting-out system. Not only did the latter adopt the new technology, it also made further modifications of the technology and facilitated the diffusion of the new technology in the cluster. The beneficial effects of the technological innovation by the cooperatives on the merchants and private producers would be discussed in section III.

6.1 Present Conditions of the Clusters and the Nature of Changes in Technology Employed

In the earlier chapters we have discussed that there exist symbiotic relations based on mutual trust and faith which are formed through recurrent transactions over a long period between weavers and traders (and intermediaries where they exist). The master trader, in view of the potential demand for the high quality products, often grants long term interest free loans to the artisans to install improved looms at their cottages, and regularly supplies the yarn to the latter who have acquired the skills to produce high quality cloth by using improved looms. The trust ensures that the weavers manufacture cloth of required quality and deliver timely. Even when the master trader has found extra demand in the market, the weavers would produce more by mobilising extra labour. On the other hand, the master trader being assured of delivery of the product of a requisite quality, concentrates more on marketing and arranging materials, for uninterrupted production. His success in this regard would provide regular work opportunity to weavers. If we consider the entire process of arranging raw materials, organising skilled labour, supervising production and then selling the products, the master trader system clearly divided the responsibilities of accomplishing the jobs between the master trader and the artisans. The master trader system thus played an important role in the development of technology. As the master trader system facilitated adoption and innovation of new technology, the latter also strengthened the former.

In the conch shell industry, both the master trader system in Bishnupur and the community organisation in Jitpur played a significant role in improving the production system by inducting
mechanised techniques. In the latter, machinery was installed by individual initiative but this has been used by the members of the community with nominal charges.

It is these pre-capitalist organisations, the master trader system and the community organisation, that provide the basis for technological development in some artisanal industries. In the sections below, we would discuss the functioning of industrial clusters and the nature of technology that the artisanal industries included in our study have employed.

6.1.1 Functioning of the Industrial Clusters

Organisational Characteristics

In the case of handloom industries, four clusters, viz., Nabadwip, Fulia, Islampur and Bishnupur, were included in the survey. Nabadwip and Bishnupur are respectively the cotton and silk weaving clusters. Islampur is a silk weaving cluster although some weavers have also been found to produce cotton cloth. Fulia, though combining cotton, silk and synthetics, is predominantly a cotton weaving cluster.

The industry of Nabadwip is dominated by capitalist producers who have set up worksheds (may be called factory), installing a number of looms operated by hired labourers (weavers) who are remunerated on a piece rate basis. The producers organise the entire production process, ranging from arranging yam, monitoring labour and marketing products, in addition to bearing the business risks (for the characterisation of the capitalist producer, see 4.3.).

In Fulia, Bishnupur and Islampur the major participants in the industry are merchants (master traders) and petty producers (artisans) engaged in the putting-out system, although in the latter two, a number of petty producers are also found to be operating independently. In Chapter 4, we have described the characteristics of the putting-out system, and particularly the master trader system.

For the conch shell product industry, two clusters, namely Jitpur and Bishnupur, have been surveyed. In the former cluster artisans belong to a particular caste and the production is organised on the basis of community system whereas in the latter, operators belong to heterogeneous castes and the production is organised through putting-out system - the main participants being artisans and merchants.

In the Bishnupur cluster, merchants and petty producers are predominant. A large section of the petty producers are attached to the merchants. Not only the attached petty producers, but also the independent ones are dependent on the merchants who have monopolised the markets for output and raw materials.

Variations in Products and Production Processes

We have already mentioned that there was variation in products and technology in the two
industries under consideration. In the following discussion we will elaborate on this aspect. At the outset we would consider the handloom industry following which the conch shell industry would be dealt with.

a) Handloom Industry

It is shown in Table 6A that the handloom clusters employ different manufacturing processes and also that their products vary considerably. We would first briefly describe the two main processes which are currently being used in the handloom industry. This would be followed by a brief description of the variations of products and the processes across clusters.

The traditional looms are the simple fly-shuttle looms in which the shuttle is thrown from side to side. Weaving any complex design becomes very difficult with this loom. In Jacquard-type looms, figured designs are woven by a mechanical selection of healds controlled by perforated roll papers (cards) for each design. The Jacquard loom thereby enables weaving of complicated designs and at the same time creates demand for new skills in design making and weaving.

The production process may be broadly segmented as design making, yarn processing, setting on the loom and weaving.

i) Design making:

The process begins with conceiving and then preparing the design of the cloth to be woven. As the designs range from the very simple, plain or box pattern to the complicated textures, the skill of the designer also varies accordingly. The simple designs are made by the ordinary weavers, but the complicated ones, like those of Baluchari, Jamdani or Tangail saris are made by the highly skilled weavers and sometimes qualified design (textile) engineers as seen in Fulia.

ii) Yarn Processing, Setting on Loom and Weaving:

1. Yarn processing: It involves bleaching, dyeing and reeling of yarn. As the operations are simple, weaver's family members do the job.

2. Setting the Loom, and Warp Threads according to Design: This is a difficult part, especially when the design is complicated. Every thread has to be arranged longitudinally passing through the reeds, and in a Jacquard-type loom, threads are tied by healds so that the shuttle can pass through generating design shoots of weft. This job is done by the most skilled members of the manufacturing unit, though assisted by other members.

3. Weaving: It is the crux of the entire process. The weaver sets the shuttle by putting a jerk to the cord attached to the picker. The shuttle is caught and stopped without rebound. The weaver uses one hand to manipulate the batten and the other hand to keep the shuttle in motion. Simultaneously the legs are pressed on the treadles to control the heddles. The simultaneous and precise operations of hands and legs require immense skills and expertise, particularly for a sophisticated design. Even in
ordinary cases, the jerk on shuttle has to be the minimum so as to prevent the shuttle from slipping out of the batten. Each time the shuttle slips, it has to be reset and also causes loss of yarn, overlapping weft shoots and thereby degradation of the quality of the cloth. Secondly, non-uniform pressure through batten on each shoot of weft also causes quality deterioration, as width of web becomes non-uniform. The woven cloth is then processed - waxed and pressed. In some cases the cloth is bleached, dyed and printed in various designs and colours.

Among the weaving clusters, in Nabadwip traditional fly-shuttle looms have been used. Important products of the cluster are a few varieties of coarse cotton cloth (Janta sari of 40 counts or below), as shown in Table 6A. The industry in the region is stagnant in the face of stiff competition from factory-made goods. Neither technology upgradation nor product diversification have been made in this cluster of industries.

In Fulia, improved Jacquard-type looms are used, and the products are highly diversified (important brands are, Tangayl and Jamdani, mostly of 100 counts), made of cotton, silk and synthetic yarns which are often blended suitably, and the product designs are often renewed.

Among the silk weaving clusters of Bishnupur and Islampur, in the former, improved looms are in use, products are of higher prices and their designs are frequently renewed. The market is widely dispersed. In the latter cluster, looms are traditional and plain cloth is woven, but substantial improvement has been made in dyeing and printing. The cloth is dyed in numerous designs and prints. Dyeing and printing jobs are not done by the weavers and for these, the merchant makes separate arrangements with the agencies engaged in these activities elsewhere. However the latter development promotes marketability and thereby the demand for weaving.

Table 6A: Handloom Industry Clusters, Technology and Varieties of Goods Produced

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Items Produced</th>
<th>Number of Varieties for each product*</th>
<th>Type of technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nabadwip</td>
<td>cotton cloth</td>
<td>4</td>
<td>traditional loom with no improvement in design &amp;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>quality of the products</td>
</tr>
<tr>
<td>Islampur</td>
<td>a) cotton cloth</td>
<td>2</td>
<td>traditional loom with improved design &amp; quality of</td>
</tr>
<tr>
<td></td>
<td>b) silk cloth</td>
<td>5</td>
<td>products same as above</td>
</tr>
<tr>
<td>Fulia</td>
<td>a) cotton cloth</td>
<td>14</td>
<td>Jacquard-type loom new raw materials with improved</td>
</tr>
<tr>
<td></td>
<td>b) silk cloth</td>
<td>9</td>
<td>design &amp; quality of products same as above</td>
</tr>
<tr>
<td>Bishnupur</td>
<td>a) silk cloth</td>
<td>8</td>
<td>same as above</td>
</tr>
</tbody>
</table>

Note: * Data relate to the month prior to the one in which survey was conducted.
b) **Conch Shell Products Industry**

In conch shell product industry, the manufacturing process consists of a number of distinct stages viz. breaking and smoothening of the two ends of a conch and the opening end of its body, washing and cleaning inside materials, slicing the conch into rings, smoothening the rings by rubbing on a rough surface, art work and designing, acid washing and other chemical treatment, and packaging the products for sale.

In Jitpur cluster a small range of products (bangles and finger rings) are manufactured by the artisans. The production process is considerably mechanised. Electric razor and grinder machines have been used to slice conch into rings and to smoothen the surface of the rings respectively. As the industry is stagnating due to shortage of demand, the average working hour of the artisans is as low as five hours a day.

In Bishnupur, the artisans manufacture a wider range of products but overall technology is the same as in Jitpur. Along with producing the traditional bangles, the artisans in the former utilise scrap raw materials to produce other ornaments of exquisite quality. The latter include necklaces, finger and ear rings, hair bands, etc. The latter activities absorb one third of the total artisans employed in the cluster.

Table 6B indicates the number of different items and their varieties produced in the two regions. It shows that varieties of items are much more in the cluster where both product and process innovations took place as compared to the industries where only partial mechanisation took place.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>No. of Items</th>
<th>Varieties*</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitpur</td>
<td>Bangles, Finger rings</td>
<td>3, 2</td>
<td>Process, Innovation</td>
</tr>
<tr>
<td>Bishnupur</td>
<td>Bangles, Finger rings, Other Ornaments</td>
<td>3, 5, 18</td>
<td>Product and Process, Innovations</td>
</tr>
</tbody>
</table>

Note: * Data relate to the month prior to the one in which survey was conducted.

### 6.1.2 Recent Changes in Technology and their Impact on Income Generation

The present discussion would be based on the following features observed in the different clusters of handloom and conch shell products industries:
i) In the Nabadwip cluster capitalist producers predominate and they failed to adopt improved technology (looms and products). In the face of competition from cheaper machine-made cloth and from improved products of other handloom clusters the Nabadwip cluster declined.

ii) In Fulia, although merchants and petty producers predominate, there has been a marked improvement in technology and products; even the petty producers installed improved looms. The merchants played a leading role in financing those investments and advancing working capital to the artisans. Similar phenomena took place to a moderate extent in Bishnupur also.

iii) The silk weaving cluster of Islampur is also predominated by merchants and petty producers, but unlike Fulia or Bishnupur, there has been no change in loom or technique of weaving; the only development that took place in dyeing and printing is outside the domain of the weavers' activity. Merchants capitalised on this development in expanding their market.

iv) In conch shell product industry both the community dominated Jitpur cluster and the merchant-petty producer dominated Bishnupur clusters observed technological progress but in the former it remained confined to partial mechanisation replacing a section of the labour force whereas in the latter mechanisation was accompanied by product innovations, particularly using scrap raw materials and low cost new raw materials, like coconut shell, and thus creating additional employment.

The implication of the adoption of different technologies over the four clusters in handloom industry would be discussed below. The relative efficiency of the technologies used would be assessed by looking at the production cost data that were obtained from the survey. This would be followed by a similar discussion on conch shell product industry.

a) Handloom Industry

All the traditional clusters of silk and cotton weaving have been facing stiff competition from machine-made cotton and synthetic goods. The readjustments of the producers to this competition have varied across clusters. In some cases there has been only product innovations and in some other cases both product and process innovations have taken place. In Islampur, for example, the merchants avoided stagnant demand by introducing improved dyeing and printing methods for which the relevant technological innovation took place outside the cluster. It is since the early 1980s that the merchants

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6 Although the exact estimate of this decline is not available, it is reflected in terms of a large number of unused looms in different worksheds. It is noted in course of our survey that almost 60% of the looms in the sample worksheds remained idle, and this unutilisation is a long term phenomenon.

7 'Process innovation' means development/use of new method of production which may involve new tools, equipments or machinery. Process innovation may or may not be associated with product innovation. The term 'product innovation' implies changes in the product's quality or its appearance without intrinsic change (e.g., introduction of a new brand) and development of new products for new use.
have brought out silk goods of attractive prints and designs in the market. The introduction of these products together with marketing advertisements has enabled the cluster to observe a fast growth of the industry.

In Fulia, the new Jacquard-type looms and cloth of improved design and quality were initially introduced by the cooperatives who also organised training for the weavers to prepare designs and operate new looms. An important feature of Fulia is that it employs a large number of weavers who have migrated from Bangladesh and who are skilled in producing different types of exquisite cloth, such as Jamdani and Tangayl. The amalgamation of these varied skills and their further refinements, and the improvement in technology both in loom and raw materials such as blending of cotton, silk and synthetic yarns, was a unique feature of Fulia. This has now become the most flourishing cluster in West Bengal handloom industry. Master traders found that the production of these varieties of cloth are highly remunerative. They financed the artisans operating with them to install these looms and asked them to produce new cloth. The former also regularly supplied finer quality yarn to the latter. The weavers soon acquired the skills for making modifications of the designs of the cloth. They learnt to produce cloth of improved quality through suitably blending cotton, silk and synthetic yarns at varied proportions. Master traders with their wider network marketed these products and helped to achieve a fast rate growth of the industry. Similarly, the artisans also found it remunerative to produce this cloth.

The pattern of income generation of the attached petty producers in Fulia for the year, 1992, as revealed in the course of our field survey, is given below. In Chapter IV, we have estimated surplus by deducting wages from value added which in turn was estimated by deducting the costs of raw materials and other non-labour variable inputs like transports, electricity, etc from the gross value of output. Gross value equals quantity produced times the market price. The artisans provided the information about the quantities produced and the market prices at which the products were sold by them (or the master trader). (The same criterion will be used for other clusters also.).

Gross value added per weaving family = Rs 3415
(mean value of the gross value added of the weavers) per month
Gross earning of the family per month = Rs 2415
Master trader's margin = Rs 1000

Since all the family members assist the weaver on part time basis for different duration, we have normalised the total labour of the weaver and his family as that of two full time (8 hours) labourers.

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8 Let $V_i$ be the value added by the $i$-th family, and $n$ be the number of family. Then value added per family, $V_F = \frac{\sum_{i=1}^{n} V_i}{n}$. 

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On that basis we find,

Value added per labourer per day\(^9\)  \(= Rs\ 61\)

Earning per labourer per day  \(= Rs\ 43.25\)

Thus,

Value added per family per day  \(= Rs\ 122\)

(\(=\)twice value added per labourer per day)

Earning per family per day  \(= Rs\ 86.50\)

In Bishnupur, Jacquard-type looms have been introduced. As discussed earlier, these looms enable weaving of complicated designs. The most important product of this cluster is the Baluchari silk. While weaving such a cloth, it requires three full time labourers of whom two have to be highly skilled. And the third has to be there just to assist them in weaving. Generally, the family supplies the assistant (family members work on shifts) and one skilled weaver. Often the weaving family hires the service of one skilled weaver on income sharing basis. The earning pattern in this system for the year, 1992, is as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Value added per weaving unit per month</td>
<td>Rs 4093</td>
</tr>
<tr>
<td>Trader's margin</td>
<td>Rs 1701</td>
</tr>
<tr>
<td>Share of the weaving unit</td>
<td>Rs 2392</td>
</tr>
<tr>
<td>Of which,</td>
<td></td>
</tr>
<tr>
<td>the share of the hired weaver</td>
<td>Rs 797</td>
</tr>
<tr>
<td>and the share of the weaver's family</td>
<td>Rs 1595</td>
</tr>
<tr>
<td>and Value added per labourer per day(^{10})</td>
<td>Rs 54.60</td>
</tr>
<tr>
<td>Trader's margin per labourer</td>
<td>Rs 22.70</td>
</tr>
<tr>
<td>Earning of a labourer per day</td>
<td>Rs 31.90</td>
</tr>
<tr>
<td>Earning of the weaving family (i.e., for two full-time labourers) per day</td>
<td>Rs 63.80</td>
</tr>
</tbody>
</table>

Though, in both Fulia and Bishnupur improved looms are used, the earning per weaver is found to be greater in the former than the latter. One of the important reasons seems to be the greater product

\(^9\) Number of working days per month is estimated to be 28. And, since, two normalised (i.e., working period being 8 hours per day) is taken, value added per labour, \(V/L = V/L(28x2)\). Again \(V_L\) per month = Rs 3415. Therefore, \(V/L = 61\) (approx.).

\(^{10}\) On an average, weavers work for 25 days a month in Bishnupur cluster. A weaving unit requires three full-time labourers. Therefore, value added per labourer per day = Rs 4093/(3x25) = Rs 54.60.
diversification and more frequent renewal of product designs in Fulia as compared to Bishnupur.

The pattern of development of technology in the Islampur cluster is different from that of Fulia and Bishnupur. As mentioned above, the improvement that took place in Islampur is only in dyeing and printing; there has been no improvement in loom or in weaving process. The weavers with the same fly-shuttle looms continue to produce the traditional cloth. The earning pattern in weaving is as follows:

| Gross value added per weaving family per month | = Rs 1592 |
| Trader's margin | = Rs 798 |
| Share of the weaving family | = Rs 794 |

If we normalise family labour hours (including part time women and children), we would find two full time (8 hours) labourers are used per family. Then,

| Gross value added per labourer per day | = Rs 30.60 |
| Trader's margin per labourer per day | = Rs 15.30 |
| Earning per weaving family (using two labourers) per day | = Rs 30.50 |

The master trader adds further value to the cloth through dyeing and printing in attractive designs and colours. Generally the master trader makes considerable investment in promoting markets for these products. This enables expansion of the production of the cloth. In this cluster the master traders deal directly (without intermediaries) with the petty producers from a distance of about 40 km. Since advancing silk yarn to the weavers was found to be risky, the weavers were required to deposit Rs 2000 as security money. To arrange this money they often have to borrow from the local moneylenders. Mobilisation of additional Rs 20000 to install improved loom seems to be difficult for a weaver. Further the caution money deposited by the weavers in turn becomes a part of the working capital of the master trader. And this may be one of the reasons why the master traders did not adopt improved looms and product improvement at the weaving stage. Firstly, in the existing arrangements the rate of profit per unit of own capital is quite high (although the exact figure is not available) as the major part of the capital of the master trader consists of the caution deposits of the weavers. Secondly, the new looms are costly for which the master trader has to invest substantial amount of money as sunk capital. Thus, the master traders who are already requiring caution money as security in order to advance yarn, would be reluctant to lend money to the artisans to install looms at their cottages without adequate security.

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On an average weavers of Islampur cluster work for 26 days a month. Each weaving unit requires two full-time workers. Therefore, Value added per labourer per day = Rs 1592/(2x26) = Rs 30.60.
The experience of Islampur may be contrasted with that of Fulia. The master trader system in Fulia facilitated technological development in weaving and raised productivity and earnings of the weavers whereas in Islampur the master trader system, although it facilitated quantitative expansion of the industry, failed to make any improvement in the technology of weaving. And thereby, the weavers have not been benefitted in terms of substantial productivity gain or higher earnings. This shows that the master trader system played different roles in different clusters depending on the local conditions, and thus, it should not be viewed as a system that is unambiguously conducive to technological development.

The experience of Nabadwip sharply contrasts with that of Fulia. The Nabadwip cluster which is located not more than 40 Km. away from Fulia has not participated in the adoption of new looms and products although similar improved looms and training programmes were introduced by the cooperatives. The capitalist producers of Nabadwip could not capitalise on the opportunity. As mentioned above, they have set up factories installing 30-40 looms. The entrepreneur purchases raw materials, hires weavers to work in the factory and sells the products (coarse Janta cloth of 40 counts or less) in the weekly market in Nabadwip where the traders purchase the products and market in Assam, Bihar and Orissa. The weavers (70% of whom are found to be women and children) are remunerated on the basis of the number of pieces of cloth woven. Very low earnings of the weavers is reflected in the cost of production data for the cluster given as under:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added per weaver (labourer) per day</td>
<td>Rs 45</td>
</tr>
<tr>
<td>Earning per weaver per day</td>
<td>Rs 20.90</td>
</tr>
<tr>
<td>Entrepreneur's margin</td>
<td>Rs 24.10</td>
</tr>
<tr>
<td>Gross earning (surplus) per enterprise per month&lt;sup&gt;12&lt;/sup&gt;</td>
<td>Rs 9450</td>
</tr>
</tbody>
</table>

As the same traditional cotton cloth is still being produced with the traditional fly-shuttle looms, the cluster continues to decline in the face of competition from the improved products in other clusters as well as from the machine-made goods. In fact a large section of the weavers of Nabadwip have migrated to Fulia.

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<sup>12</sup> Average installed capacity of the enterprises is 38 looms of which 40% (i.e., approximately 15 looms) are being utilised. Number of working days per month is around 27. Gross earning per enterprise per month = Number of looms used (i.e., number of weavers) x Number of working days per month x Entrepreneur's margin per employing one labourer per day.
b) Conch Shell Products Industry

In the conch shell product industry, till twenty years ago the entire process of manufacturing used to be done manually. However, machine has been introduced in both clusters in two phases. In the first phase, machine driven razors replaced labourers who used to slice conch shell by hand razor. The grinder machine, in the second phase, replaced a substantial section of the artisans who used to polish the rings by rubbing on the surface of a piece of stone.

In Jitpur, there has been no change in the product - the traditional rings are still produced. With the shrinkage in labour demand, the artisans have not been able to switch over to new activities. This means that fewer jobs are now shared by the community members\(^\text{13}\). The average working period per day is around five and a half hours whereas in weaving or other activities it is around 10 hours. On the average, two working members per family are found to work and each earns around Rs 35 daily. Their monthly family income amounts to Rs 1910\(^\text{14}\).

In the Bishnupur conch shell product industry the same process of employment shrinkage is also in evidence. But the reduced number of jobs are unevenly distributed. Those artisans who do not find jobs in ring or bangle making have now switched over to manufacturing ornaments from scrap raw materials. The two types of mechanical instruments are also used in processing the scrap raw materials. This subsidiary activity absorbs a third of the labour force employed in the conch shell product industry in the cluster as a whole. As mentioned above, this industry in Bishnupur is highly monopolised by few merchants, the artisans receive lower prices for their products and pay higher prices for the raw materials. Consequently, the earnings of the artisans become very low. On the average there are three working members per family working for 8-10 hours daily and each earns Rs 17. Irregularities in the availability of raw materials often reduce the number of working days per month to around 24. Monthly family income comes to Rs 1235 (i.e., three workers' earnings together). It is interesting to note that a few highly skilled artisans are now using coconut shell as new raw material to produce exquisite quality bangles and other art work. They also use mother pearl for the production of decorative items.

We may now briefly recapitulate the main points observed above. Firstly, the master trader system of Fulia and Bishnupur facilitated technological progress in the cluster. Master traders have financed artisans in installation of improved looms and regularly made advances in terms of yarn. The

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\(^{13}\) The displaced artisans are now looking for jobs in that part of the manufacturing activity which needs manual labour such as for art work on the polished rings. Had there been enough growth of production, these artisans could have got gainful employment in art work. The shortage of conch shell and lack of demand makes the artisans unemployed or underemployed.

\(^{14}\) In a family two members work for around 27 days in a month. Although the daily working hours on the average is around 5.5 to 6 hours.
former also made investments in promoting marketability. Artisans also trained themselves in operating new type of looms and preparing new design of cloth. The over-all effect of the changes is that the artisans are benefitted and the cluster as a whole developed to a significant extent. Secondly, capitalist producers of the Nabadwip cluster did not take much interest in technological development, and left a large section of the looms idle and gradually withdrew working capital as the market demand for their traditional products declined. They substituted high skilled weavers by cheaper and low skilled labourers (mostly, women and children). This caused loss of employment of the skilled weavers and thus they had to migrate. Thirdly, in Islampur, the master trader system has helped the growth of the weaving industry (in terms of quantity), but could not bring about any qualitative change in weaving technology. The weavers could not benefit much in terms of increased productivity and income. Fourthly, the master trader system in the conch shell industry of Bishnupur is highly exploitative. Product diversification was made by the artisans for mere survival. But in Jitpur, community organisation facilitated mechanisation. In spite of reduced working hours in Jitpur, the average earnings of an artisan per day were double the amount earned by an artisan in Bishnupur in the industry. Finally, relative differences in weaving technology in different clusters are, in part, reflected in differences in earnings per labourer (weaver) per day. As seen above, the earnings per labourer per day were the lowest (Rs 20.90) in the technologically backward cluster (Nabadwip) and the highest (Rs 43.25) in the technologically most advanced cluster (Fulia). The reasons for this contrasting behaviour of the clusters in responding to technology change would be discussed in the next section.

Given the above features of the industries, we may ask the following questions:

1. Why is there significant growth and technological progress in the merchant dominated Fulia region whereas in the capitalist dominated Nabadwip region there is stagnation and no improvement in technology for long? This in turn is related to some other questions: (a) Is there any advantage of the pre-capitalist system over the capitalist system in case of handloom industry? (b) Are there alternative avenues of profitable investments for the capitalists of Nabadwip cluster, or are they financially weak and thereby ignoring reinvestment and restricting technological innovation in handloom industry?

2. Why do the merchants not migrate to Nabadwip and make the necessary improvement in the cluster?

3. How do the capitalists of Nabadwip manage to make large profits even when 60% of their fixed capital remains unused?

4. Why do the artisans of conch shell product industry in the Bishnupur cluster, in spite of their worse conditions, make greater innovations as compared to the better off artisans of Jitpur?

In the following section we shall raise the above issues.
6.2 Some Explanations of the Variations in Adoption of Technology across Clusters of Handloom and Conch Shell Product Industries

a) Handloom Industry

We would first address the most striking contrast in adoption of technology as observed between Fulia and Nabadwip. In spite of their locational proximity, the former has made enormous improvements in technology whereas the latter shows no signs of change in this regard. We have mentioned above that in the former the interested parties include master traders and the petty producers, most of whom are skilled migrant weavers, and in the latter they are the capitalist producers. The obvious question arises as to why the capitalist producers did not play their commonly projected role in promoting new technology in Nabadwip, and why the merchants and petty producers are much more active in modernisation in Fulia. This may be explained in terms of the internal dynamics of the clusters - the organisational bases enabling the producers/traders to ensure timely production with required quality, initiatives in taking new ventures, and the external factors like alternative avenues of investment.

We would first mention some of the points explaining the causes for the stagnation (or even decline) of the weaving cluster of Nabadwip. The first is the continuation of the production of traditional coarse cotton cloth which has been facing competition from the mill made synthetics and cotton cloth. Secondly, the capitalist producers did not adopt improved technology so as to produce cloth of improved quality and design, as done by the producers of Fulia. This brings us back to the question we raised above, namely why did the capitalist producers not adopt improved technology whereas the weavers of Fulia operating under master traders could adopt this technology. Its answer may be found in terms of the following:

Firstly, the capitalist production does not enjoy any significant scale advantage over the master trader system. If the capitalist wants to raise the scale of operation, he has to add more looms in his factory. And the number of weavers has to be raised by the same proportions. In other words, by expanding scale the capitalist cannot economise any costs (either of capital or of labour) to any significant extent. Further, the new technology is highly skill intensive. Operating a number of looms in a factory (single workshed) requires hiring of skilled weavers. (Sometimes they are required to be trained to operate new looms and in new designs). Any way, the cost of hiring a skilled weaver would rise as he would be reluctant (or demand higher wage) to work in the factory of the employer; rather he would prefer to work at his cottage because that would enable him to employ his family members. In Fulia, the master trader system, through putting-out, overcomes this problem.

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15 The hired weaver would demand Rs 86.50 (double the amount he alone earns) which he could earn along with his family members while working in his cottage.
Secondly, the capitalist producer in Nabadwip has to organise all the activities relating production and bears all the risks. The marketing experience of these producers is confined within the Nabadwip cluster. Adoption of new technology requires substantial investment not only in new looms and other materials, but also in marketing infrastructure and advertisement outside the locality, in geographical areas with which they are unfamiliar. Undertaking marketing promotion is a difficult task for them and thereby investment in new technology becomes highly risky. 

Thirdly, the capitalist producers of Nabadwip generate a large volume of surplus per year (as shown by the surplus of the medium-sized independent producers in Tables 4C.3 & 4C.4, and a gross profit of Rs 113400 (that is twelve times the monthly earning of Rs 9450) annually per enterprise in Nabadwip). It is also revealed in our field survey that on the average 60% of the looms per factory remain idle. It may be puzzling at first sight how the capitalists could manage to extract higher surplus (or high profit margin) in a situation of the declining condition of the industry, and with so much of excess capacity. But this is possible through substitution of highly skilled weavers by unskilled labourers who are remunerated at a much lower wage rate. It is revealed in the course of our field survey that around 70% of the weavers in the factory of Nabadwip are women and children who work at a very low wage ((piece) rate. One may compare the differences in the average earning per weaver between the Nabadwip cluster and the Fulia cluster. The respective figures for the two clusters are Rs 20.90 and Rs 43.25. A reduction in labour costs therefore helps the producers to maintain high profit margins. Although we have noted the possible reasons for not reinvesting the surplus, and for withdrawing working capital, we have failed to locate the possible avenues where the capital is being channelised. Only one of the sample entrepreneurs has responded that he has invested in land (orchard at the vicinity of the Nabadwip town, which may be sold later at high price as the town is expanding fast). This may be a general phenomenon and seems consistent with the high rate of profit and overall declining condition of the handloom industry.

However this leads to another question: why did the merchants of Nabadwip not play the same role as they played in Fulia, or why did the merchants of Fulia not come to Nabadwip to take over production? We shall discuss the question below.

The high cost of employing hired weavers in the factory may also explain why merchants did not come and adopt new technology in Nabadwip. We have already mentioned that the capitalist production is the predominant form of organisation and the producers employ hired labour (weaver). The adoption of new technology would require hiring of skilled weavers in the factories. This would raise unit costs of production (e.g. wage costs would be doubled). Further, since family labour does

\[\text{The cost of installing a new loom is around Rs 20000. However, this problem in Fulia did not arise as this task was performed by the experienced merchants who have established contacts in the towns and cities.}\]
not exist in Nabadwip weaving, any merchant coming from outside would also have to operate within the factory system and this is not profitable. Moreover, if the merchant wants to operate through the capitalist producers, the latter would demand some amount of profit. In other words, the predominance of capitalist producers in the Nabadwip cluster acted as a constraint on technological development, both directly, in terms of not adopting new technology themselves, and indirectly through eliminating low cost family labourers, in that area.

b) Conch Shell Product Industry

It would now be discussed why in spite of the fact that both the clusters of conch shell product industry attained a similar degree of mechanisation, only the Bishnupur cluster has seen diversification into other products - scrap raw materials have been used to produce new products and a new cheaper substitute (though not perfect) of existing raw material is now used by the artisans, and in the Jitpur cluster the same traditional bangles are produced. As stated above, in Jitpur community based production organisations predominate whereas in Bishnupur the merchants and petty producers operate often through putting-out system.

We have described above the characteristics of the community based organisations of the Jitpur cluster - the group harmony. There partial mechanisation is primarily meant for relieving the artisans from excessive toils specially for slicing the hard conch by hand razor and smoothening the conch ring by rubbing on the surface of a stone. Since the industry did not expand, mechanisation led to a reduction in employment. However the reduced availability of jobs is now shared by all through community organisation. On the average, two working members per family work for 5-6 hours daily and earn around Rs 35 each. In spite of reduced working hours the artisans manage to earn a reasonable level of income. Monthly family income amounts to Rs 1910.

As opposed to this, in the Bishnupur cluster the merchants and petty producers are the main actors. Some of the petty producers operate independently and some others through putting-out under the master trader. Both types of petty producers have installed machines for which the former borrowed from banks17 and the latter from the merchants. It is observed that they work for 8-10 hours per day with these machines but their earnings remain at a very low level. The monopoly of a few merchants in the markets for product and raw materials put the terms of exchanges of the independent petty producers extremely unfavourable, i.e., high cost of raw materials and low product prices. As regards putting-out, it is a classic example of what Marx described as 'Modern Domestic Industry'18.

17 The State provided the artisans loans at highly subsidised rate of interest and with easy terms and conditions. The artisans are benefitted much from these loans. This role of the State deserves special mention and we will raise this issue later.

18 Marx (1986a), pp. 438-442
Mechanisation has been a tool of the merchants for furthering exploitation of the artisans. On the average there are three working members per family working for longer hours daily and each earns Rs 17. Irregularities in the availability of raw materials often reduce the number of working days per month to around 24. Monthly family income comes to Rs 1235 (i.e., three workers' earnings together).

As the demand for traditional products (bangles) and the availability of raw material (conch) did not rise, mechanisation reduced the number of jobs. Unlike in Jitpur where reduced number of jobs are evenly distributed, in Bishnupur the reduced number of jobs are unevenly distributed. This rendered a sizeable number of artisans in Bishnupur jobless and some others have been super exploited\textsuperscript{19} by the master trader. The latter often charged the artisans very high prices for the conch and paid them low prices for the finished products like bangles. The artisans then started using scrap raw material (leftover of the parts of a conch after utilising it for making bangles) to produce items like, finger rings, ear rings, necklaces, hair bands, etc with the help of machine. By this their working hours increased. At present this subsidiary work employs one third of the artisans engaged in the industry. Merchants gradually monopolised markets for these products also. In consequence the earnings of the artisans could not increase much.

Some artisans started preparing highly attractive bangles and other ornaments by using coconut shell and decorative items by using mother pearl and selling through State emporia\textsuperscript{20}.

In Bishnupur, it is the mere survival needs which led the artisans to innovate products,\textsuperscript{21} whereas in Jitpur with a reasonable level of income and lower working hours, ensured by the community system, the artisans did not find it so urgent to go in for such low priced highly labour intensive products.

It needs to be pointed out that even in the same area, Bishnupur, the master trader system played different roles in different industries - in handloom the master traders are not as exploitative as in the conch shell product industry.

The experience of the different clusters show that the historically evolved organisations together with specific local conditions to a great extent determine the pattern of technological improvement.

\textsuperscript{19} For want of better expression we have used the term 'super exploitation' which means exploitation of a high degree.

\textsuperscript{20} The role of State in encouraging the artisans through providing training and financing the artisans and marketing their products is and will be discussed later.

\textsuperscript{21} This, however, does not mean we are neglecting the various assistance given to the artisans by the State, and the master traders' lending to the artisans.
6.3 Cooperative and Private Entrepreneurs Interaction in Developing Technology

The State's role in improving technology of selected industrial cooperatives needs to be analysed. Our field observation highlights that the State has evolved improved looms and product designs both for silk and cotton cloth. National and Regional laboratories have been engaged to evolve these technologies. Jacquard-type looms have been developed and adopted in the late 1960s and early 1970s, subsequently further modifications have been made.

These looms have been introduced through the cooperatives. New looms enable the weavers to weave finer cloth often with blended yarns of silk, cotton and polyester. A wider variety of new designs of the cloth have been introduced. These products attract customers of wider regions. Generally middle income and high income groups are the customers of these products. Keeping in view the changes in tastes of people, products (both design and quality) are also modified.

In Fulia and Bishnupur, new looms have been introduced in the late 1960s and early 1970s by the cooperatives. Along with this the cooperatives also organised short term training programmes to operate new looms and prepare new designs. Subsequently, while the cooperatives failed to make any further development, the merchants could make use of this development in technology and the skills. They made investments in installing improved looms and advancing raw materials as well as for advertisement for promoting market. The new and attractive products of these clusters found a steady market.

When the new technology was introduced by the cooperatives and the master traders found weavers skilled enough to operate new looms and capable of preparing new designs, they did not hesitate to capitalise on the opportunity of investing in new looms. Moreover, the market for the products was already developed to an extent by the State through its advertisements in promoting sales and setting up emporia like Tantuja in urban centres. The weavers also found it advantageous to acquire new skills as it would raise their prospects of employment and ensure larger earnings. The overall condition therefore appeared highly conducive for the introduction of new technology by the master trader. What the master trader had to do was to make investment in installing looms and arranging raw materials. The master traders did not remain restricted to that, they located new markets, assessed prospective changes in tastes of the consumers and the potential demand, and placed order to the weavers who with their immense skills and expertise easily prepared new designs and products. Blending cotton, silk and synthetic yarns with optimum proportions was an outcome of such effects.

The introduction of these new technologies requires training the artisans to operate the new tools and implements, and to prepare designs; it also needs investments in market promotion as well as the financing of the artisans to purchase expensive new tools, implements and raw materials. The State has introduced training programmes through cooperatives for the member weavers in the regions of Fulia, Nabadwip, Bishnupur and Islampur clusters; it granted loans and subsidies to install new
implements, and set up State emporia in various cities and small towns.

With the Jacquard-type looms there was an initial setback - the products were not being sold. One reason was the inadequate market promotion: what was essential to make the potential consumers acquainted with the new products was not undertaken. Secondly, the artisans were not trained enough to operate the new tools effectively which caused the manufacture of inferior quality products. However, in the subsequent years the artisans acquired the knowledge through 'learning by doing' and also the tools and implements further improved. Over time the weavers not only learned to develop designs but also to make modifications of their implements.

Although the cooperatives pioneered in bringing about new technology and created externalities benefitting the artisans as well as the master traders, cooperative in itself could not maintain it leading role in the subsequent periods through further improvements in technology. This task has, however, been taken up by the master trader.

The master trader system adopted these technologies and promoted further. The master traders assisted the artisans to set up improved looms in the latter's cottages. The artisans trained in new technologies, who often remain unemployed due to shortage of yarn or other problems in the cooperatives, prefer to work with the master traders for regular jobs. These artisans ensured quality production and on regular basis to the master traders who could therefore concentrate on marketing products and buying raw materials. Symbiotic relation between the master traders and the artisans facilitated effective cooperation and reduced transaction costs to a considerable extent. Cost effectiveness and assured manufacturing enabled the master traders to secure a high rate of turnover and a high rate of profit. Master traders also benefitted from the State's advertisement for the promotion of markets for the same handloom products manufactured in the cooperatives.

Artisans on the other hand find it advantageous to acquire new skills as that would ensure jobs and higher wages. Although a few artisans received training organised by the cooperatives at the beginning, others learned from these artisans. Even the agricultural workers have joined these artisans. The traditional apprentice system provides an elastic supply of skilled labour force with little cost of skill formation. These artisans not only learned how to operate new looms and weave cloth of new designs, often with blending various yarns of silk, cotton, and synthetic fibre, but also in design making. Parallel to this, design engineers have been operating supplying a variety of new designs every year. The master traders, skilled in marketing, assess the prospects of various types of cloth and place orders for manufacturing which the artisans promptly deliver. This kind of technological dynamism developed in rural areas could not have taken place without State's initiative and launching the new technologies through the cooperatives.

For a discussion on skill formation in the traditional apprentice system, see Raj (1997).
6.4 Summary

We have assessed the viability of a production organisation by its ability to induct new technology in the production process. It is found that the master trader system in a number of clusters (particularly weaving) was able to introduce improved techniques in the artisanal production system. The master trader granted loans on easy terms to the artisans to install improved looms in their cottages. Master trader also provided the required raw materials to the artisans and marketed the new products. In fact the former made substantial investments in developing marketing infrastructure. On the other hand, the artisans soon acquired the expertise of operating the new looms and preparing new designs. In Fulia, they suitably blended cotton, silk and synthetic yarns at varied proportions in order to produce varieties of cloth. With the introduction of new techniques, the income of the artisans increased considerably as reflected in terms of their higher incomes as compared to the weavers operating with the traditional looms in some other clusters.

We have further noted that in the Nabadwip cluster where capitalist producers predominate, there was no technological progress. The capitalists produced coarse cotton cloth using traditional fly-shuttle looms and employing a large number of hired weavers under a single workshed. This cluster has been stagnating for long as it faces stiff competition from the urban machine made goods as well as from other weaving clusters producing improved quality cloth. In view of the stagnant or even declining demand, the producers kept a large proportion of their looms idle. They also shifted to employing less skilled weavers, namely women and children and paid them low wages (piece rates).

Alternative explanation are tried for this phenomenon. The most important one seems to be the system of hiring weavers as it would raise the labour costs substantially for producing high quality products with improved looms. Not only the wages of skilled weavers would be high but also they would demand double wages because at home (under putting-out system) they could employ family members also.

The experience of the weaving clusters of Fulia and Bishnupur shows that under certain circumstances, pre-capitalist organisations facilitate technological development. One such pre-capitalist organisation is what we have described as the master trader system. However, there are other variants of the master trader system where the relations are found to be highly exploitative as seen in the conch shell product industry of Bishnupur. Here artisans introduced new products for mere survival. In Islampur, the master trader system facilitated quantitative (and spacial) expansion of the industry without improvement in the weaving technology or labour productivity. The only development took place was in dyeing and printing from which weavers did not benefit.

The above observations suggest that there exist certain conditions under which merchants may act as a progressive force as compared to the capitalists, in technological development. However, the development of technology in the master trader system in some weaving clusters needed initial
stimulus which was provided by the cooperatives. The pioneering role of the cooperatives in introducing new technologies and imparting new skills to the artisanal production system will be discussed in the next chapter.