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Capacity of Technological Change in Mughal India

Abstract

The fact that medieval India had developed an exceptional degree of manual skill, which seemed to compensate for the crudeness of implements. "Numerous are the instances", says Bernier (1663), " of handsome pieces of workmanship made by persons destitute of tools.... some times they imitate so perfectly articles of European manufacture that the difference between the original and copy can hardly be discerned." Fryer (1674), speaking of a surat coral worker, "wondered (at) the tools he worked with, more than his Art, because we see it surpassed in Europe, but with far more invention of Instruments. Here hands and feet being all the Vice, and the other tools misshapen bits of Iron." Elsewhere, again he says : "And by this small Taste of their unweariedness in Painstaking, their Cheapness of every thing and their faring hard, all their other Craftmen may be valued, who work for nothing comparatively with our Europeans though in many things they exceed them for curiosity, as in staining of Calicuts (Calicoes), and fine work either in gold or silver."

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Introduction

The situation that we visualize then is an abundance of skilled labour, which, owing to low subsistence costs, inhibited improvement in tools. A finer product could be attained more cheaply by a larger application of labour and manual skill than by adopting a mechanical refinement. This would doubtless not apply where, as in liquor distillation (received in India, 13th-14th centuries), the product could not simply be attained by any greater input of labour/skill. In other cases too, where the labour-saving by a mechanical invention could be enormous, the improvement would be cheaper than any possible multiplication of muscle power.

Of this, perhaps, the most outstanding example is calico-printing. The Original chintz, Hindi chhint, Sanskrit chitrapeta, was painted cloth. In the 17th century the Masulipatam artists painted chintz for the world market. But this was luxury product ; there had been a steady substitution of printed chintz for the painted. The painting block enabled the printer, with less skill and labour to produce a far larger quantity of decorated cloth than the painter. It is possible that cloth-printing in India is not older than the 14th century. India is almost certainly the country of its origin, though inspiration may have cone from paper printing or inked seals, both diffused from China by the Mongols. Yet paper printing would not be adopted in India because the scribe would still work cheaply and with much art.

But the outstanding example of the rejection of a labour-saving device because of simple 'skill-compensation' can be offered from the textile industry itself. The drawl room was a device long used in Iran for weaving patterns. But this was seldom adopted in India. To produce their famous flowered muslin, the Decca weavers, working in pairs, laboriously counted the appropriate warp threads and lifted them through the insertion of bamboo stick at each throw of the shuttle. In Kashmir the weavers resorted to what was in essence embroidery rather than use the drawl room.

Thus one important inhibiting factor was the presence of a relative supply of skilled labour, which Indian civilization had managed to create by centuries of commodity, or market-oriented production. "A good it has unnumbered and endless workmen of every kind."The large population of skilled labour had its corollary in low wages; and in petty production, where the artisan owned his own tools, the pressure of competition compelled him to sharpen his skill, rather than improve his tools on which he could not afford more expense.

The development of skill meant extreme specialization ; and India therefore saw a multiplicity of professions which occasioned much surprise to European merchants. Pelasert (1626) said that there were in Agra:

"Goldsmiths, (calico) painters, embroiderers, carpet-makers, cotton or silk weavers, blacksmiths, coppersmiths, tailors, masons-builders, stone cutters, a hundred crafts in all, for a job which one (workman) would do in Holland, passes through four men's hands before it is finished.

The picture may be corroborated by Abul Fazl's description of the different occupations within the mint : coin-changers, weighmen, ore melters, gold-plate makers, refined-metal melters, ingot casters, engravers, silver refiners, hammersmiths for refined silver, assayers, gold-separators, and silver separators.

Such specialization was mostly brought about by a socially set division of labour, the caste system. While it helped to increase skill, an improvement in technology could be further inhibited by the barriers of ignorance inherent in the isolation of hereditary castes. "There is a fixed caste for every sort of work and for everything", observed Babur, "which has done that work or that thing from father to son." Max Weber's well-known argument was that since the caste created 'segregation of skills' and prevented inter-craft mobility it would prevent any technological improvement. It may be recalled that in Indian technology inter-sectoral diffusion of particular devices is very rare; and this very closely fits in with the Weberian thesis.

Another argument in Weber is the submergence of all individual ambitions by caste rigidities. Bernier (1663) would have agreed, for he observed that :

"No one (aspires) after and improvement in the condition of life wherein he happens to be born. The embroiderer, brings up his son as an embroiderer, the son of a goldsmith becomes a goldsmith, and the physician of the city educates his son for a physician."

There is no doubt that, over the long run, castes altered their professions and there were fresh entrants into particular professions through the rise of new castes or even assimilation by old castes. Fukazawa tells us of the caste of tailors of Maharashtra, which during the earlier part of the 18th century took to dyeing, while another section of the caste separated to undertake indigo dyeing. Yet, after all, Weber's argument only stands qualified; it does not totally fall. Caste system has survived because of its capacity to accommodate and adjust to economic change. But since it so closely suited the pressure for skill specialization in the medieval economy, the hereditary division of labour and the socially set 'segregation of skills' could not but be important negative factors in the development of production technology.

If then there were only limited inducements for innovation within craft technology, the question may be asked whether it could not be externally induced by the higher, non producing classes. The question may be supplemented by an illustration. The Mughal aristocracy had taste for fruits, especially Central Asian fruits. Thus in their orchards they laid out waterworks (with 'Persian wheels'), imported gardeners and seeds, and most important, encouraged the practice of grafting. The quality of the oranges was very greatly mangoes (initially introduced by the Portuguese with the 'Allonso' in the 16th century appeared in northern India under similar impulses. Could not improvements in mechanical technology be similarly made where the control over production processes lay with the aristocracy, as in the Karkhanas (or workship within the Imperial and aristocratic establishments), or by the merchants when they directly organised production (in their Karkhanas, or in mining, ship-building, etc.)?

The same appears to have been the case with merchant controlled production. In the Deccan diamond mines where thousands of miners were employed (and each employer had 50 to 100 under him), 17th century descriptions shows the lease holders making practically no investments on apparatus, so that even water was carried up by buckets transferred from hand to hand. In the textile industry where the 'putting out' system (both in material, and money) was in vogue, the looms belonged to the weavers, and neither the Indian merchants nor the English East India Company even concerned themselves with their improvements. The only instances where the quality of loom becomes of concern to the English factory is when a particular width could not be made with the existing looms, and the weavers asked for advances to have broader looms made.

Still more striking was the case with the Indian ship-building industry. From about the middle of the 17th century, Indian ship-builders began at Surat to copy closely the Dutch and English designs of ships, and the results were eminently successful. Nevertheless, not a single European machine or apparatus is known to have been used in that industry. Apparently the carpenters and others went on working with their own existing tools. We therefore see, again, the copying of the product but not of the technology.

In other words, since tools were not yet separated from the artisan, and capitalist relations had not yet developed even in an embryonic form, craft-technology remained outside the scope of externally induced change. However, the very formulation of the problem in this manner makes an opposite question inevitable. Why did not classes which controlled a share in the social surplus enter the productive process and improve technology, as happened in western Europe, from the 16th century onwards?

It must be realized that neither in Europe in India in the 15th or 16th century was there any definite inevitability in the process of economic and technological change. There were constraints in the social structure, it is true, both in Europe (with its previous feudal order, serfs and guild-monopolies) as well as in medieval India. But there was no absolute 'social determinism' operating at any particular point. It was partly, at least, a matter of ideology as well.

It is true that the application of 'scientific' designs to craft technology were not direct or simple matters of transmission from paper to wood and metal. Inventions, to become economically viable, had to wait for favourable circumstances. But there is no doubt that actual production technology in western Europe began to receive scientific influences from the 16th century onwards, and a two-way relationship between craft technology and theoretical science continued to get closer until the Industrial Revolution at last created the conditions for their merger into a practically single system.

This was not surprising since around that time science received a setback throughout the Islamic world, its last great representatives being Bu 'Ali Sina (Avicenna, d. 1037), Alberuni (fl. 1030) and Ibn Rushd (Averroes, d. 1198). There was a heavy onslaught on reason (ma'qulat) and philosophy (falsafa), in which Ghazali (d. 1111) played an important part.

In medieval India, therefore, Islam was received when the scientific tradition in it was in the process of decay. Abul Fazl at the end of the 16th century was to mourn.

Abu'l Fazl; who was Akbar's minister and theoretician, was at least himself an exception to this traditionalism. He emphasized his respect for the Hellenistic sciences and cites the classical Islamic rational philosophers. He was the first to describe scientifically the method of liquor distillation in India, if not in the Islamic world. He also exalted the contrivances ascribed to Akbar, the importance of which especially lay in that they were supposed not to entertain but to do down-to-earth work, such as cleaning gun-barrels, grinding corn or lifting water. Here the right-angled gearing was of the saqiya kind. But Abul Fazl insists that there were innovations too in the manufacture of guns and muskets, which clearly derived from Europe. In chemistry there was the invention of water-cooling through use of salt-petre, which seems to be independent of any discovery made in Europe.

These achievements are impressive, not so much because of their substance as of the spirit that they point to. But the spirit was confined to the court and there too it soon died. It had from the beginning perhaps a religious basis, in that the tolerance of science stemmed not so much from a belief in reason as from a belief in Pantheism, which taught one to respect diversity. Ever since the time the doctrines of Ibn al-Arabi (d. 1240) had reached India (c. 1400), Pantheism had begun to exercise a powerful influence on the Muslim mind, and Akbar appealed to it expressly to justify his religious policy and claims to be the vicegerent of God on this earth. Thus the apparent revival of science at Akbar's court was not backed or reinforced by any general system or systems of rational philosophy.

Moreover, the aristocracy retained a scornful attitude towards the ordinary people. A horror of the common man obtaining was shared by everyone, from Akbar to his bitter critic Badauni. The emperor approvingly quoted the action of Shah Tahmasp in punishing an attendant who supplied a portion of a verse the Shah had forgotten. This attitude made any interest in the technology used by the common man still more remote. The Mughal Empire has produced not a single worthwhile text on crafts or agriculture, how many volumes of poetry or histories it might have to its credit.

Aim of the Study

The medieval period in its later part corresponds with the tempestuous development in European technology during the 15th and 16th centuries, preceding the Industrial revolution. This correspondence in time inevitably excites, one's curiosity as to whether medieval Indian technology displayed at any time and place .The foremost question which arises in the mind of students of history that our Indian technology preceded the European science and technology.In this paper i have tried my best to focus superiority of science and technology over European and Asian Countries.

Conclusion

The Indian ruler's refusal to respond to western science and thought was thus at par with their indifference to technology. Both added up to an enormous intellectual failure of the ruling class. That failure must always be assigned its due share of responsibility for what did not happen in India-a quickening of technological change even remotely reflecting, if not independently corresponding to, the accelerating progress of Europe.

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