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Technology and Unemployment

In der konventionellen ökonomischen Theorie kann man wählen zwischen Preisstabilität und Vollbeschäftigung, aber man kann niemals beides zusammen haben, obwohl einige Länder, wie z. B. die Bundesrepublik Deutschland, an beiden Fronten gute Ergebnisse aufweisen. Ein Problem besteht darin, daß die Technologie laufend die Beschäftigung vermindert, die notwendig ist, um die menschlichen Bedürfnisse zu befriedigen. Dienstleistungen können bis zu einem gewissen Grad die Arbeitslosigkeit überbrücken, die durch den technischen Fortschritt hervorgerufen wurde, aber dieser Sektor ist nicht ganz verläßlich und auch psychologisch nicht zufriedenstellend. Zwar können Umschulung und Mehrfach-Beschäftigung das Problem mildern, doch ist es anerkannt, daß die Kunst diese Frage besser lösen kann, da sie ein angemessenes Feld für die kreativen und psychologischen Bedürfnisse der Menschen darstellt, die durch die Technologie von der produktiven Arbeit freigesetzt werden.

Introduction

In the past several decades, social insurance has increased to such an extent in the developed countries that unemployment no longer causes physical deprivation the way it used to. In consequence, unemployment is no more the traumatic experience it once used to be. Unfortunately, the monetary protection which the unemployment insurance provides, hides several harmful effects of unemployment. Two of them will suffice for the present: unemployment results in a loss of time - the output which the unemployed worker could have produced if he had been working, is lost for ever. Secondly, it diminishes the self-image of the individual and produces serious psychological effects, as Brenner (1979) has shown. (His findings are given in summary form in *Table 1*). Thus, even from purely

Table 1 Estimated increases in psychopathological conditions in the U.S. due to an excess of 1% unemployment over a period of six years.

Item	Estimated % Increase
1. Cardiovascular mortality	1.9
2. Suicide	4.1
3. Homicide	5.7
4. Mortality for other reasons	2.0
5. First admission to mental hospitals	3.4
6. Admission to state prisons	4.0

Source: Brenner (1979)

economic considerations, unemployment is triply expensive: (a) resources should be found for providing unemployment benefits; (b) production is lost and is lost forever due to enforced idleness, and (c) additional cost has to be borne to treat the various mental and physical illnesses that result from unemployment.

The Trade-off between Inflation and Unemployment

So far there is no consensus regarding the causes and cure for unemployment. In fact, economists, who ought to know best, are bitterly divided among themselves and some even question whether unemployment is a primary disease or whether inflation is the greater one. This arises because of the feeling that there is an inevitable natural rate of employment and that it is impractical for anyone to modify it usefully and that a policy of status quo will lead to a lower inflation rate at the expense of some temporary unemployment. This is based on the premise that a macro-economy will be ideally in balance (although this almost never happens) when the aggregate supply and demand in the economy are such that they are both equal to the GNP corresponding to full employment (*Fig:1*).

The term full employment is a notional one and does not mean that everyone has work to do. Physically this is impossible, because at any one time, some are sick, some are on a holiday, some are in between jobs etc. So there will be even at the best of times some without work. How many these will be or should be is probably an unanswerable question. So full employment corresponds to that position of the working force which wants to work and is in a physical condition to do so. It is the function of finance ministers the world over to constantly juggle their policies such that the aggregate demand and supply intersect, as shown in *Fig.1*, for a GNP corresponding to full employment. If the intersection occurs for a lower GNP, the economy produces less than what it can, there will be a recession, less jobs will be available and there will be excessive unemployment. On the other hand, if the intersection occurs for a GNP greater than the optimum, there will not be enough people to meet the demand, wages will shoot up and inflation will result.

There is a view held by such influential figures as Milton Friedman that, for any given economy, there is always an optimum GNP and a natural rate of unemployment, and moreover, that whatever the government may do, the economy will finally settle down at this rate of unemployment. So they advocate that governments should not interfere with the economy at all. The opposite view is that it is improper and degrading to let people remain unemployed and that more jobs should be created by stimulating the economy, usually by increasing the money supply. This

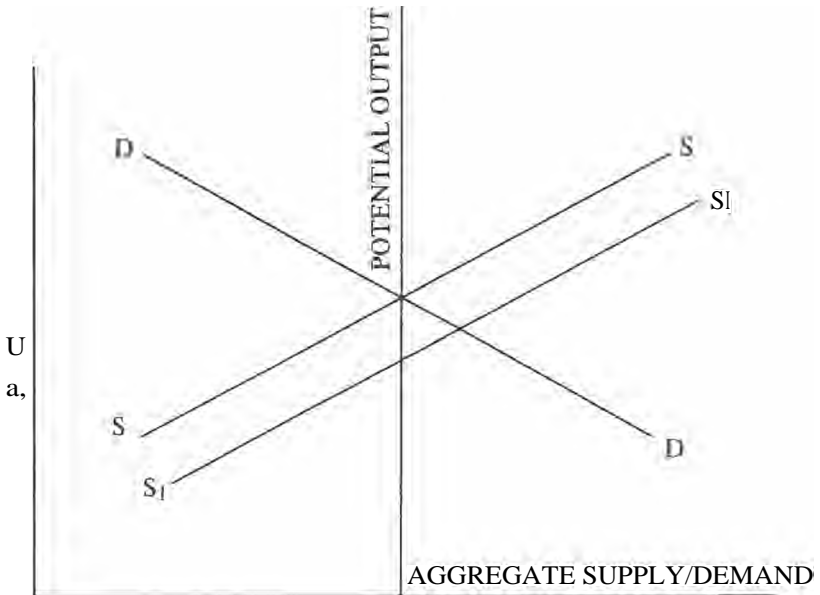


Fig: 1. Under equilibrium conditions, the aggregate supply curve SS and the aggregate demand curve DD should intersect for a GNP equal to potential GNP corresponding to full employment. Technological progress will shift the aggregate supply curve to the right from SS to S,S_1 .

naturally leads to inflation. The two scenarios are indicated in *Fig.:2*. As it shows, there is a trade-off between temporary inflation and a permanent price increase on the one hand (with expansionary policy) and temporary unemployment and a permanent loss of output on the other (with status quo policy).

Political Reaction to Unemployment

Which of these two scenarios is preferable is largely a matter of political taste. This issue has been studied by Hibbs (1984) for several Western nations and his findings are summarised in *Table 2*. It may be seen that at one extreme, a two per cent increase in unemployment will cause a Swedish politician to lose 11.5 per cent support while at the other extreme for a West German politician, the corresponding loss would have been barely 2.5 per cent. Inflation on the other hand, had no terrors at all for the British and very little indeed for the Swedes whereas the Americans were

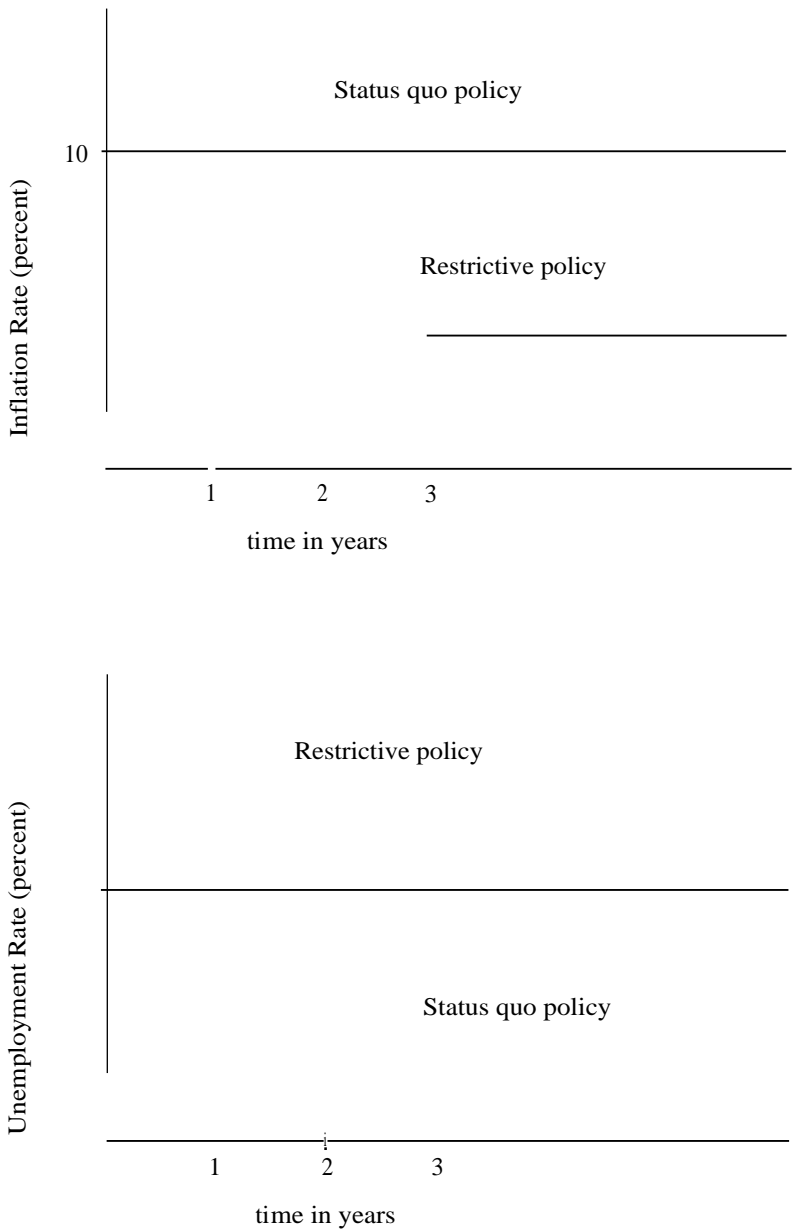
*Fig: 2.*

Table 2 Change in Support for Political Leaders in Five Countries in Response to Sustained Increases in Rates of Unemployment, Inflation, and Income Growth in the 1960s and 1970s.

Country	Quarters covered	% change in support in response to a 2% increase in			
		Real income growth	Unemployment	Inflation	Change in inflation
France	1969:4-1978:4	+3.8	-2.5		...
Sweden	1967:1-1978:3		-11.5	-0.5	
United Kingdom	1959:4-1978:4	+2.8	-6.4		-2.6
United States	1961:1-1978:4	+5.4	-4.5	-6.2	...
West Germany	1957:4-1978:4	+2.1	-2.5	-1.7	

Source: Hibbs (1989)

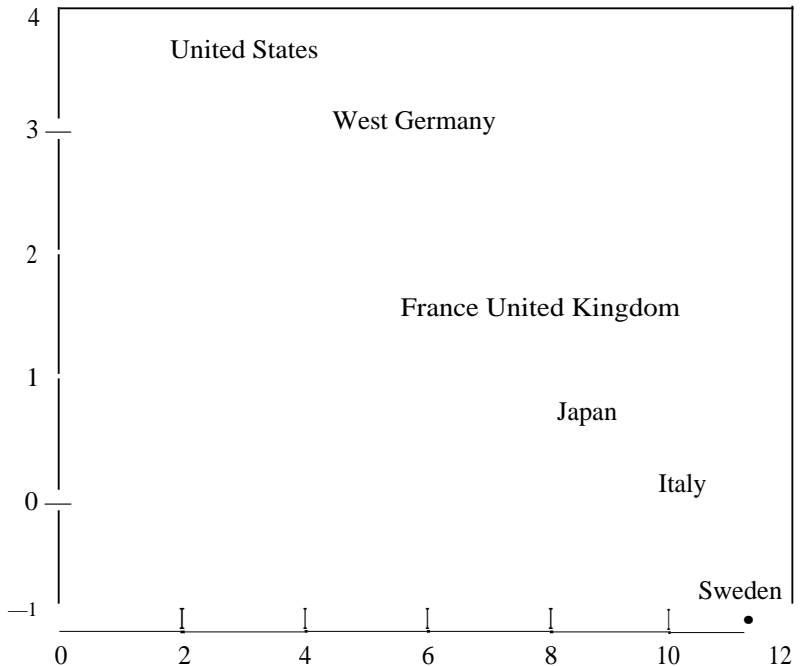
very, very concerned about it. The Americans were also found to be very keen on real-income growth, while the Swedes seem to be indifferent. Strictly speaking, this analysis showed that the Germans were, by and large, equally conservative and realistic about all these three factors of real-income growth, inflation and unemployment. On the other hand, the British and Swedes were obsessed with unemployment while the Americans were obsessed with inflation. It must, however, be emphasized that political attitudes are volatile and are liable to change rapidly from time to time and hence, these findings should be considered valid only for the duration of the investigation.

It is also interesting to consider how different countries reacted to the unexpected and severe supply-side shock caused in 1973 by the sudden escalation of oil prices. Various governments attempted to manage the crisis mainly by adjusting the money supply. The relationship between the changes in excess money supply that was adopted and the percentage change in unemployment rate that resulted thereby has been worked out by Gordon (1977) and shown graphically in *Fig:3*. At one extreme, Sweden actually decreased its rate of unemployment in spite of the oil crisis by resorting to a massive increase in money supply, while the U.S. opted for a tight money supply even when faced with a large increase in unemployment.

Consequences of Technological Progress

Fig:3 typifies the kind of consequences one may expect from the different policies one may follow as a reaction to sudden changes in the economic climate. The changes induced by technology are rarely as drastic as the oil

Change in unemployment rate (percentage points)



Average rate of change of excess money supply

Fig. 3. Changes in Unemployment and the Average Growth of the Money Supply Less Growth of Trend of Real Output in Seven Countries, 1973-1975.

crisis, but on the other hand, they set a persistent trend even if they are not always of a shocking nature. As a result of technological progress, productivity increases, less people are needed to produce the same output and in addition, new products which were never thought of before come into the market, generating a new demand which never existed before. It is also true that such new products make some old ones obsolete. For instance, the advent of calculators effectively killed the slide-rule. However, whenever such a technological replacement occurs, the very fact the new product has to be superior to do so, implies that there will be a net economic gain. Thus, although jobs were lost due to the collapse in the demand for slide-rules, the new jobs created by the new demand for calculators were far larger. This has been the case so far: steam engines replaced horse carriages, plastics replaced steel, digital watches replaced

mechanical ones, pop music replaced churches and such changes always generated a new increase in employment. However, the situation of those who did lose their jobs were often traumatic and tragic.

For several reasons, the GNP corresponding to full employment does not remain static, but varies with time. It might increase because of population increase, because more women join the work force, because there is excess immigration into the country and also, and quite significantly too, due to progress in technology. For the U.S., it is estimated by Denison (1962) that the contribution made by technology and education to the real growth in GNP to be of the order of 1.6 per cent per annum - that is, technical progress alone will double the real GNP every 40 years. In other words, for a given output, the amount of labour required to produce it halves every 40 years. As shown in *Fig.3*, this shifts the supply curve to the right and lowers the equilibrium point for a lower price level and for a lower employment level. For instance, the number of farmers required to feed the population has continuously decreased reducing the employment in agriculture and the relative cost of food in proportion to the total real income. If the demand is inelastic, as in the case of food, the progress in technology destroys jobs and destroys them permanently. Therefore, something else has to be done to provide jobs for all those made redundant.

Limits to Industrial Employment

Under these circumstances, the only way employment can be maintained at its full level is for the demand also to shift correspondingly as shown in *Fig.3*. It was stated that technical innovation introduces new products, which on the balance, do increase employment as, for example, the way microcomputers are doing because of the semiconductor revolution. While such a positive development is often the case, it too cannot continue forever. For instance, in the field of transport, we can visualise a socio-technological sequence starting from manual effort, to animals, cycles, scooters, cars, still better cars etc. One may even get to the situation, and we often do, when some families have two or more cars, but this progression may actually come to a halt, with the individual ending up as a hippie, buying nothing! In any case, some time or other, saturation does set in. It might set in, not merely because people get satiated but also because minerals run out (as is likely to happen in several cases in the next few decades) or because nature is unable to support so many artifacts - pollution increases and increases beyond tolerance limits. In any case, there is a limit to what one can possess - even Mrs. Marcos had only a finite number of shoes! Thus, when industrial demand becomes less

than that of technological progress, employment sustainable in industry also starts decreasing. As *Table 3* shows, this has already started happening in many industrialised nations.

Table 3 Changes in percentage of labour force in industry and in services for some industrialised nations between 1960 and 1981.

Country	% Decrease in Agriculture	% Decrease in Industry	% Increase in Services
United Kingdom	50	13	16
Austria	63	20	80
France	64	-	35
F.R.G.	70	4	32
Australia	45	18	24
Denmark	61	6	28
Canada	61	18	28
Sweden	65	27	50
U.S.	70	11	18
Switzerland	58	8	27
Belgium	63	14	28

Source: World Development Report, World Bank (1985)

Employment Potential of the Service Sector

If neither agriculture nor industry can sustain the current level of employment, the only recourse we are left with is the service sector. Fortunately, the service industry has the useful property that the quality of the service generally increases with the density of employment. That is, the larger the number of doctors, teachers, and hair dressers, the better the service can be expected to be. This is exactly opposite to the situation in manufacturing industry, where automation increases both the quantity and quality of production simultaneously. Thus, in industry, technical progress normally provides an improvement in quality of production by reducing employment, while in the services, an increase in quality requires an increase in the number of people employed. As *Table 3* shows, this is a trend already evident in most countries. If, as is likely to happen, the consumption of manufactured goods also saturates while production technology keeps apace, the employment in manufacturing industry also may one day, dwindle to a mere 5 or 6 per cent as it has already happened in agriculture. At present, some 38 per cent of the employment in the industrial countries is in the secondary sector. If the 1.6 per cent productivity growth is maintained, we may expect that by this time in the next century, the employment scene might change so drastically that some 90

per cent of the employment may have to be in the service sector. Effectively, the people will then be trying to get rich by taking each other's washing!

The Unemployability Prolem

Meanwhile, there will be a major transition problem. The continuous reduction in manufacturing employment will mean that a number of people will lose their jobs in the prime of their lives. They may not be financially impoverished because there will be enough production to keep all in comfort, yet there could be severe psychological problems. »Udyogam purusha lakshanam« - employment is the ornament for man, says a Sanskrit proverb and these days this is true for women also. So mere allocation of income is not going to be a really satisfactory condition for those deprived of work. Already, leisure has become as important as work and this has not added to human happiness in the way one would have expected.

There is also the danger that even the services may come under the bulldozing authority of technology. At the present time, music is a growing and a popular industry which provides employment to many and satisfaction to many more. However, we can visualise a time when no musician will be able to compete with the virtuosity of the computer and a few, very few computer musicologists would be able to produce all the variety of music the world demands. A similar situation may arise with gourmet food and with many other services.

Education for Employment

Thus we can visualise a situation where an increasing redundancy in manufacturing with a growing horde of willing but unemployable people (like coal miners at the present time) clog the employment market. Of all countries, Germany has so far tackled this problem best. By and large, unlike the opposite case of Britain before Thatcherism, Germany never tried to protect existing jobs unduly, but expended a great deal of effort in retraining its workers for newer job openings. It could succeed in doing so because it had the wisdom to entrust this responsibility for re-education not to educational institutions but to industry, and more significantly, to the trade unions who were better situated to determine what kind of jobs will suit best the market.

Multiple Employment

Nevertheless, even this may not be enough. As already pointed out, unlike in Germany, in most countries unemployment rouses a pathological fear and as a corollary, many, no doubt in the most short-sighted and perverse way, resist even a change in their profession. So it is necessary to evolve a system by which this psychological resistance to migration from one occupation to another is reduced. Also, as explained at the very beginning, it is essential that people are kept occupied and protected from unemployment as much as possible, because otherwise, there will be the triple burden on the society. No doubt, each society will eventually find a solution to this problem in its own way. One possible solution could be, for as many people as possible, especially the unskilled and semi-skilled ones, to have multiple occupations, to work at several jobs simultaneously. This is nothing unusual. People who work on contract have always worked in this fashion. The suggestion is to extend this arrangement - an individual may be a coal miner, a bus driver, a construction labourer and a gardener all at the same time. Obviously, it cannot always be easy to do so, but whenever possible, it would be worth attempting.

This is also a natural extension of how masses of people have developed in their occupations over the ages. For centuries, most were bound to the feudal lord, not merely individuals, but entire families were bound so, and not only for a lifetime, but for generations. As a step forward, this bondage was reduced to one generation at a time. Thus, it became the norm for a person to hold one job for one employer and for life. A further improvement came when this was restricted to the active working years only. Even now, in many countries, it is the norm rather than the exception to work for the same employer throughout one's working life. However, the current trend is for an employee to have the freedom to change jobs, but not the freedom to work at more than one job at a time. This is not entirely a fair arrangement because the loss of employment to an employee is a far greater loss than the loss of an employee to an employer. As pointed out already, provision of unemployment insurance is no true compensation for the loss of human dignity involved in losing one's job. When economic and technological changes preclude the guarantee of employment, it would be desirable for the individual to have the freedom to choose to work for more than one employer at a time.

While one could visualise directly many difficulties in providing many people multiple jobs when it is difficult to find even one, we can also see many advantages of this arrangement. Firstly, the probability of a serious loss of earnings becomes smaller and smaller as the variety of jobs the individual is engaged in increases. This is simple arithmetic and happens because it is unlikely that all the jobs the individual holds will all become

redundant at one and the same time. Secondly, innately this makes the individual versatile and provides a richer experience with his or her work. Thirdly, it psychologically attunes the individual to experiment with the various kinds of jobs available - at least there will be diminished emotional resistance to attempt a change. Fourthly, it provides enough time to look for alternatives. At the present time, once an unemployed worker accepts a job opening, there is little time to try for a better one. Also, at present the pressure is enormous, as it is either a job or nothing situation. When there are several jobs to go to and each is a part-time one, it is easier to search around for a better combination. Fifthly, it provides an opportunity for anyone to attempt what one likes to do rather than one has to do. At the present time, for example, a software engineer is a software engineer all his working hours or possibly all his working life. If emotionally his greatest interest is to tinker with cars, or to pilot aeroplanes, it will be virtually impossible to indulge in such disconnected but unusually satisfying activities. When people have multiple jobs, it may be easier to indulge oneself in such activities more easily.

Obviously, the significant objection to this scheme will be the difficulty of keeping track of each individual in all the vocations he or she may be engaged in and the problem of continuity at the work place. If the objective is individual satisfaction and not the convenience of the organisation, the latter cannot be a major objection. As for the former, it will no doubt require a new kind of management, but when we are already able to coordinate such complicated systems as space launches or selling hamburgers to whosoever wants it, where one wants it, how one wants it, when one wants it, this may be a difficult but not an unsurmountable difficulty. Without underestimating the problems involved, multiple jobs seem to be a natural extension of how human civilization has been evolving; they will be at least a convenience, if not a necessity, whenever economic and technological progress make employment patterns unstable.

The Promise of Art

This presupposes that there will be enough jobs to go around and be handled on a part-time basis. As mentioned already, it is problematic whether this type of scheme can be implemented successfully. Hence the hope that the service sector will fill in all the vacancies generated by technological progress may not be fulfilled. There is, therefore, a need for an additional avenue for employment which will not saturate even if the service sector, let alone the industrial sector, does. In fact, this is not really the problem of the distant future and is already on us in many countries.

Obviously, there can be no simple solution to such a severe problem but one of them that holds great promise is the filling of the vacuum that technology creates by art. To take an example, it took barely five months to complete the UN building, but it took decades just to paint the ceiling of the Sistine Chapel. Technology tends to shrink everything in the time domain - art, on the other hand, expands it and can expand it interminably. The matchbox structures, the functional furniture and the like, that is currently in fashion, may be utilitarian but do not fulfil the higher aspirations of human beings. Centuries hence, no one is likely to be inspired by looking at them as historical or archaeological artifacts - assuming that they can even survive till then. But a work of art is not merely a thing of beauty but a joy forever. It will provide a meaning to life, a richness to individual existence that virtually no technology can provide in the same fashion. Art is infinite in its variety and infinite in its levels of achievement - from the humblest to the greatest it can provide a niche. So any society which has the cash to spare should invest it in promoting art, in elevating humanity and not in diminishing its self-image by doling out charity or squandering it in mindless leisure.

Conclusion

The single-minded pursuit of technology in the past several centuries has no doubt provided unparalleled benefits to mankind. In the process, it has also in some respects, tended to shrink, rather than elevate people. One particular problem technological progress is generating is the reduction of human effort to provide all that human beings physically desire and thereby diminishing a sense of purpose for many. One way to reduce the risk of unemployment that technology generates is to institutionalise a system of multiple employment so that no one is dependent on one single occupation.

So far the service sector has taken up the slack in employment generated by technology, but even here, saturation is likely to set in and it may not be possible to provide gainful employment for all or for the full working period.

If the consequential traumatic experiences have to be avoided, we shall have to look beyond technology and it appears as though art is the best hope. So when technology is coupled to art, we can have the former to meet our physical needs and the latter to satisfy our higher instincts. Then, every piece of manufacture will be a piece of art, lovingly and caringly made by proud hands and not a mere utility made impersonally by a mindless, heartless machine and by hands which know not what they are doing.

As mentioned earlier in the case of music, computers and technology can take over art also. But if there is any avenue for human ingenuity to overcome the darkening shadow of technology, it is art and art alone. The question will be asked, where will be the demand for so much art when, even now, most artists are without work. The answer lies in re-education. One cannot sell cars without teaching people how to drive. Similarly, we cannot sell art without teaching people to appreciate it. Art appreciation is conspicuous by its absence in all school curricula. That is where we have to start.

If »Udyogam purusha lakshanam« is true, »Kalaa sarve Kalyaanam« (Art is the well-being for all) will be even more true.

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