INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

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Science, Technology and Society

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After discussing certain transcendence of the simple categories of intended and unintended consequences of social action altogether what we are going to do I mean these are a few instances that you will find in which the very process of technical development is so thoroughly voyaged in a particular direction that it regularly produce this result counted edge wonderful breakthroughs by some social interests and crossing setbacks by others.

I mean there are two viewpoints the as in the case we have discussed in the in the book in the context of Weber in the context of Marcel in the context of winners Langdon winners article do at effects of politics and that Mumford characterization of or classification of technologies in terms of authoritarian and democratic okay thereby we try to give you the example of Robert Moses McCormick and so okay.

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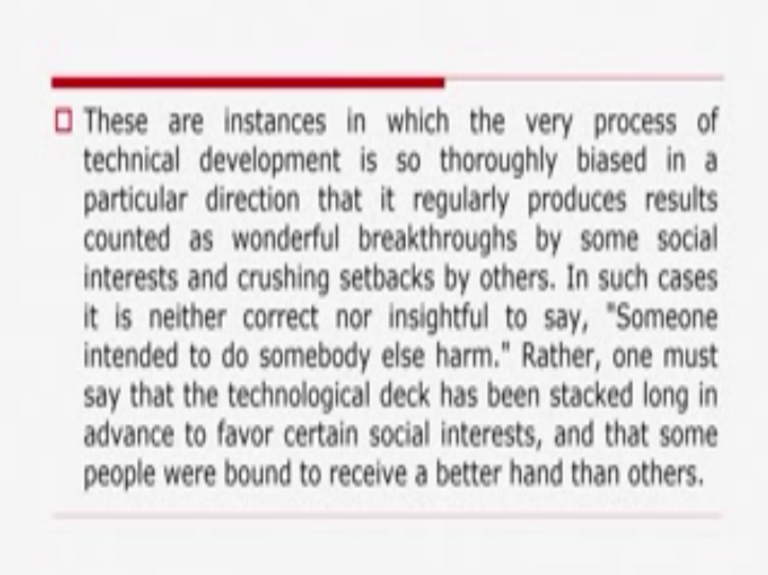

And in such cases it is neither correct not insightful to say let me quote here Langdon wheeler someone intended to do somebody else harm that is why whenever we talk about technology okay we must talk about technology in the context of the way it is designed and controlled rather one must say that the technological deck has been stacked lonely not one to favor certain social interest certain political interest certain economic interest okay.

Even certain cultural interests it is very important that is why we try to discuss the way cultural sciences are different from Natural Sciences again finished in the writings of what the real theory and methodology and that some people were bound to receive a better handle okay then social interest political interest economic interest market interest a state interest cultural interest they differ from one group to the other.

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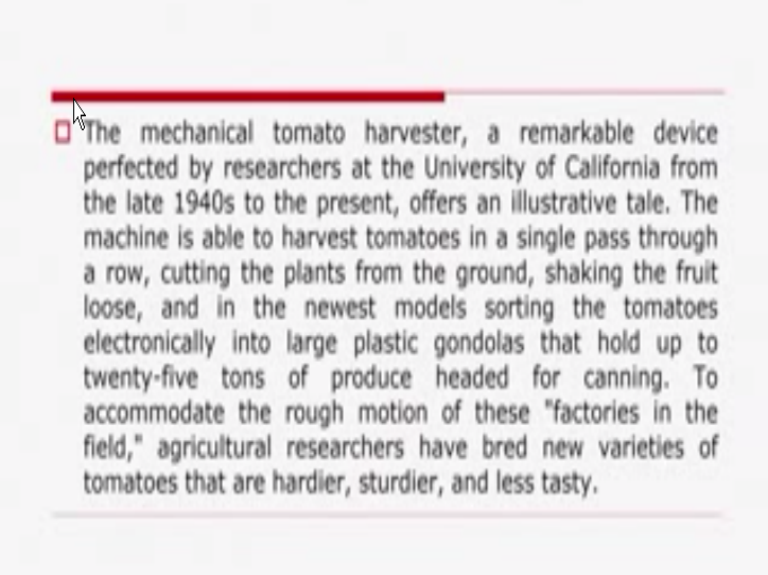

The mechanical if I if you closely read do it affects the politics by like the winner you will find that that the way he was trying to give provide example that the mechanical tomato harvester a remarkable device perfected by researchers at the University of California from the late 1940's till the present offers an illustrative tale the machine is able to harvest tomatoes in a single path through a rope cutting the plants from the ground taking the fruit loose.

And in the newest model chopping the tomatoes electronically into large plastic gondolas that hold up to 25 tons of produce headed for carry to accommodate the rough motion of these factories in the field agricultural researchers have great new varieties of chemicals that are that are hardier sturdier and less tasty okay.

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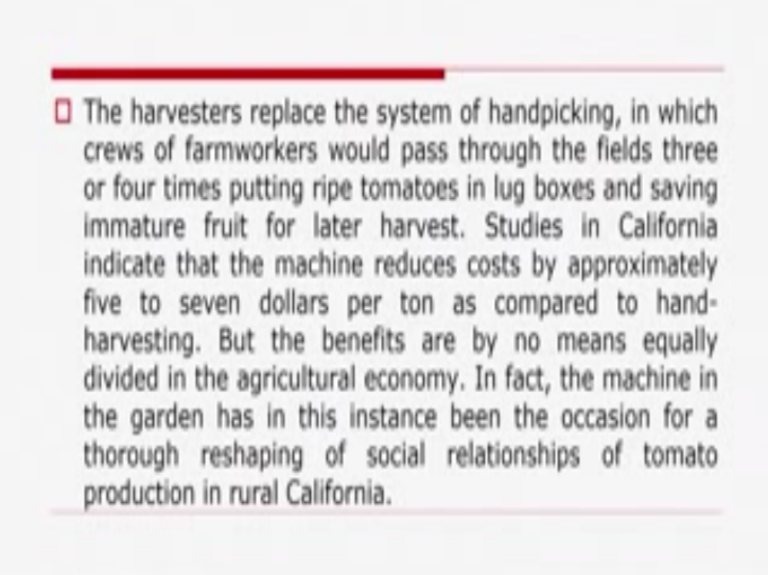

I mean politics of food politics of taste politics of conjunction politics of production politics of social groups must be understood at length and indicate the harvesters to replace the system of hand speaking in which crews of farm workers would pass through the field three or four times putting right tomatoes in lug boxes and saving immature fruit for later harvest studies in California indicate that the missing reduces costs of cost by now by approximately five to seven dollars per ton.

As compared to hand harvesting but the benefits are by no means equally divided in the agricultural economy in fact the machine in the garden has in the in this instance been the occasion for a thorough reshaping of social relationships of stomata production in rural California okay that is why I decorate the point of politics of food politics of taste politics of consumption politics of production and the politics of social relationships which are forged over a period of time in the context of the production of a particular crop okay.

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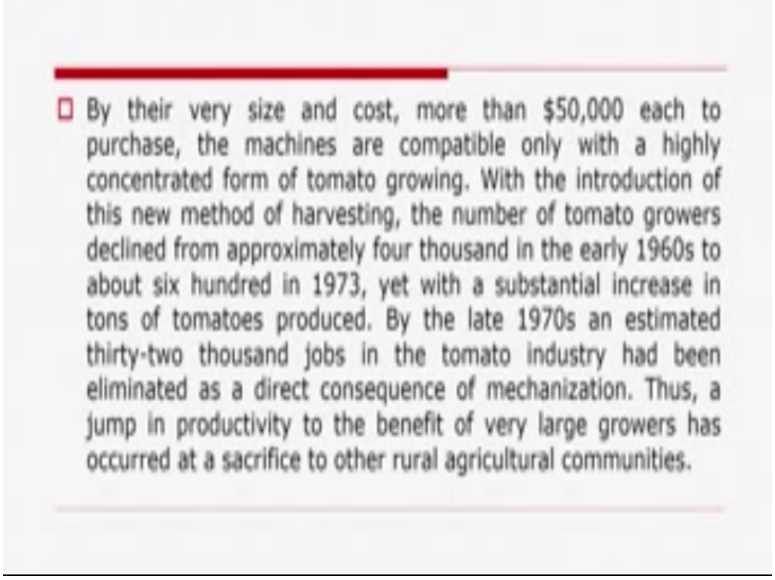

By their very size and cost more than fifty thousand US dollars each to purchase the mesons are compatible only with a highly concentrated form of tomato growing with the introduction of this new method of harvesting the number of tomato growers declined from approximately 4,000 in the early 1960s to about 600 in 1973 yet with a substantial increase in terms of tomatoes produced by the late 1917 an estimated thirty two thousand jobs in the tomato industry had been eliminated as a direct consequence of mechanized thus a jump in productivity to the benefits of large growth has occurred at a sacrifice to their rural agricultural communities which can also be traced in the context of agriculture in India.

In the context of industrial production in India and so on eventually if you look at the situation of India you will find that even if our production and productivity production win and no when I say I mean volume of production when I say productivity mean greater product okay even if the agricultural production and productivity has increased over a period of time what will generally feel what we generally find that that such a jump in productivity to the to the benefit for to the benefit of very large number of words has occurred at the sacrifice to other rural agricultural community okay.

You can look at any, any agricultural crop in India and we will find the same situation okay a texture you may take the example of rice you may take the example of brinjal tomato take the example of tomato overall production has increased pulses overall the production has increased

but at the same time it has effect it has adversely affected the rural agricultural communities because of these external factors okay.

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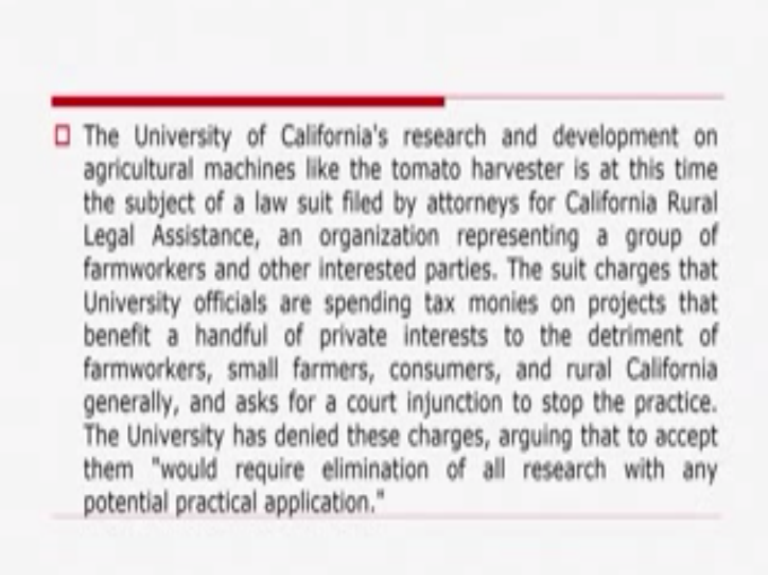

But in this context Landon winner try to locate the University of California's research and development on agricultural lipids like the tomato harvester is at this time the subject of a lawsuit filed by attorneys for California a rural legal assistance and organization with and which is an organization representing a group of farm workers and other interested parties the structure will suit charges that University officials are spending tax money on projects that benefit a handful of private interest to the detriment of funding worker small farmers consumers.

And Google California generally and ask for a court injunction to stop the practice the University has denied these charges arguing that to accept them would require elimination of all research with any potential practical application the similar practice we can also witness in the context of bitty seeds in the context in the context of Indian agriculture where you will find plant varieties and farmers Rights Act of 2000 2001 you will find that they are representing now agricultural cultivators and they are trying to interrogate the imposition of bacillus Turin genesis form of food bitty seeds on rural agricultural communities in particular and Indian population in general

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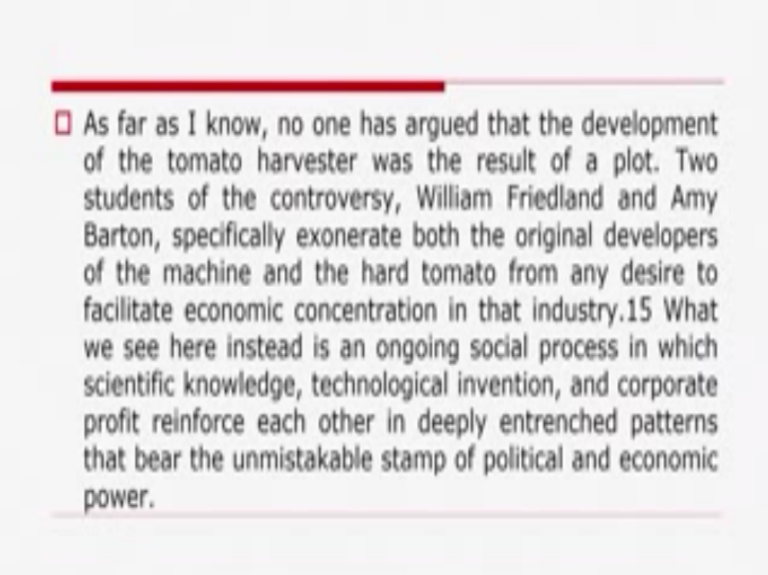

As far as I mean for according to winner no one has argued that the development of the tomato harvester was the result of a plot he winner tried to elaborate on this I mean to students of the controversy William Fried land and any battle they specifically exonerate both the original developers of the machine and the hard tomato are from any desire to facilitate economic concentration in that industry what we see here instead is an ongoing social process in which scientific knowledge technological invention and corporate profit reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power.

That is why what matters is not technology itself but the social or economic system in which it is embedded that is why I repeat that what we see here instead is an ongoing social process in which scientific knowledge one technological invention two and corporate profit three reinforce each other in weakly entrenched patterns that bear the unmistakable stamp of political and economic power.

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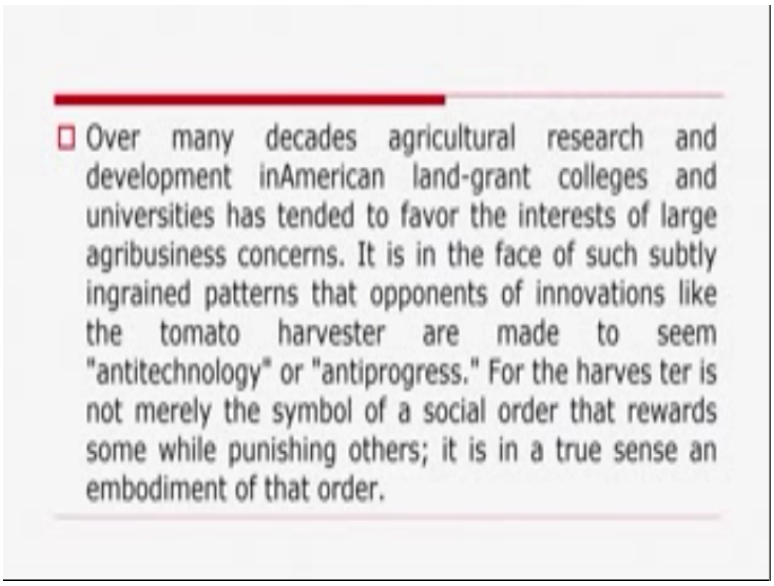

Over many decades agricultural research and development in American land-grant colleges and universities has tended to favor the interests of large agribusiness concerns it is in the face of such subtly ingrained pattern that opponents of innovations like the tomato harvester are made to seem anti-technology anti-progress for the harvester so the harvester is not nearly the symbol of a social order that viewers some wise some while punishing others are over some while punishing others it is in a true sense an embodiment of that order then, then, then whoever supports technology okay.

Becomes the voice of the state and whoever interrogate specific technology okay if projected edge is portrayed edge and anti-state anti-technology anti-progress I think, I think we must go beyond these extremes okay that is why for the harvested is not nearly the symbol of the social order that lured some while punishing others it is in a two cells and embodiment of that social political economic or cultural order.

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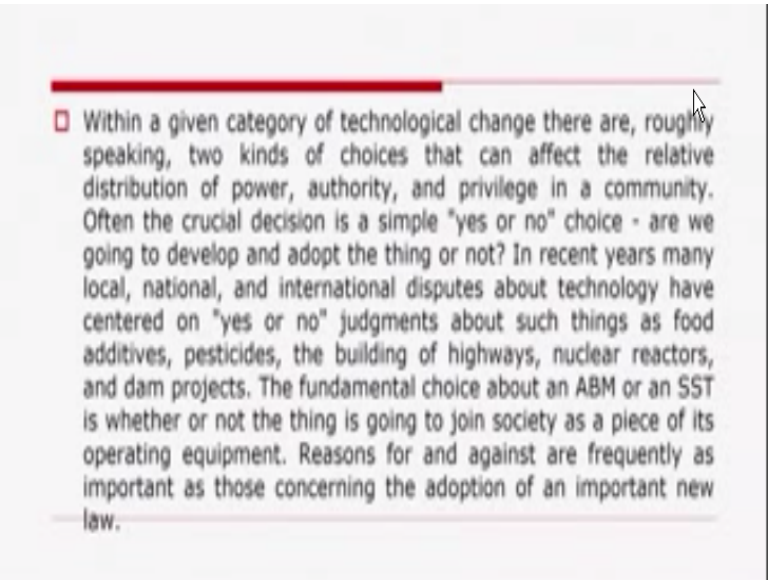

Within a given category of technological change there are roughly speaking two kinds of choices that can receive affect the relative distribution of power authority and privilege in a community I mean one power that can offer a third privilege in a community often the personal decision in a simple yes or no choice okay are we going to develop and adopt the thing or not in this LTS many local national and international disputes about technology has centered on yes or no judgment.

About such things as a good additive pesticide the building of highways nuclear reactors and dam projects the fundamental choice between, between yes or no okay in whether or not the thing is going to join society as a piece of its operating equipment but he was trying to look at winner was trying to look at necessity and reason for and against such, such construed okay frequently as important as those concerning the adult kind of an important new law.

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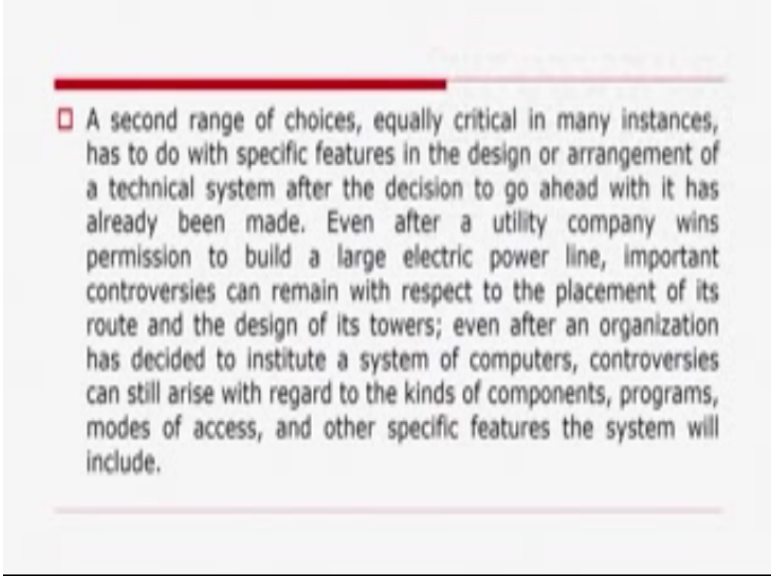

A second range of choices equally critical in many instances has to do with specific features in the design or arrangement or control of a technical system after the decision to go ahead with it has already been made even after a utility company wins permission to build a large electric power lines important controversies can remain with respect to the placement of its rooms and the design of its towers even after an organization has decided to institute a system of computers controversies can still arise with regard to the kinds of components programs modes of access and other specific features the system will include.

If you if you go back to Kuhn's normal science this is the tradition that we are trying to face you that we are confronted with we have already discussed Kuhn's normal science Kuhn's paradigmatic shift using normal okay perhaps, perhaps these are certain anomalies which we are not anticipated which we are not intended which you are not expected then in the context then, then, then, then with the passage of time with the with the progress of civilization what we encounter today let people measure that really but also we are in a crisis perhaps, perhaps let me put it this way that perhaps we are in the stage of post-normal science which includes anomalies as well as crisis except okay.

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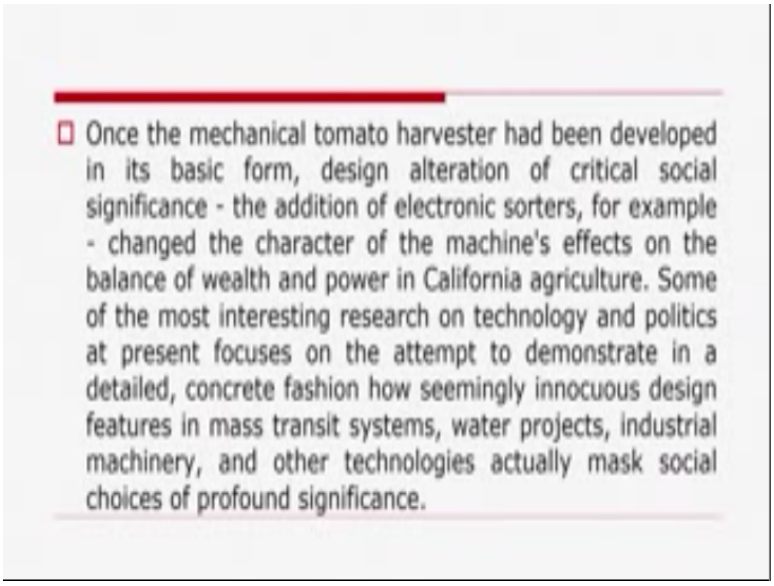

It does not imply that only anomalies will lead to crisis you may encounter crisis first and then you can shift to another paradigm mediated by the revolution once the mechanical tomato harvester had been developed in its basic form design alteration of critical social significance I mean the addition of electronic sorters for example change the character of the lessons effect on the balance of wealth and power in California agriculture some of the most interesting research on technology and politics experience focuses on the attempt to demonstrate in a detailed concrete fashion how seemingly no post design features in mass transit systems water project industrial machinery and other technologies actually mask social choices of profound significance.

This is important I repeat once the mechanical tomato harvester had been developed in its basic form design alteration of critical social significance change the character of the machine's effect on the balance of wealth and power in the agriculture of California and India is no exception to this some of the most interesting research on technology and politics at present focuses on the attempt to demonstrate in our detailed concrete fashion how similarly you know post design features in mass transit systems water project industrial machinery and other technologies actually mask social choices of profound significance that is why we discuss we have already discussed so what kind of choices that we make what kind of selection that we make that is a Weber said selection is based on social cultural realities let us say social choices that we make they are culturally mediated.

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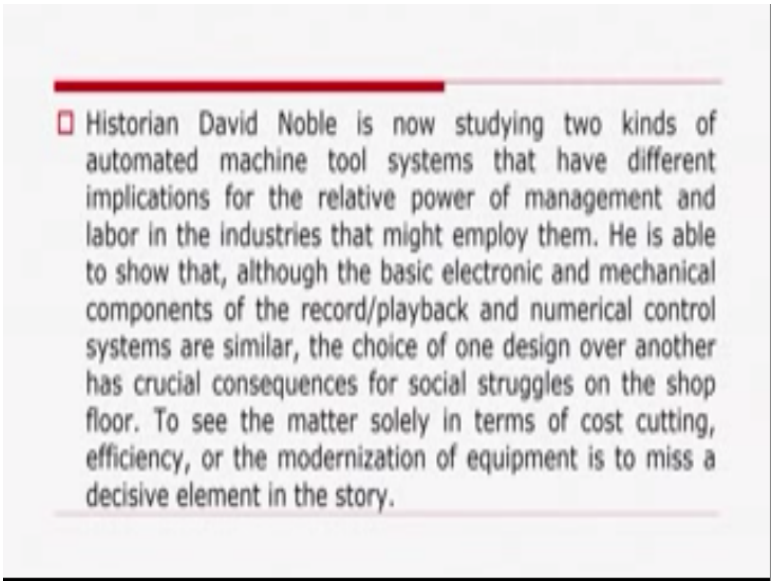

Historian though David Noble studied two kinds of automated method two kinds of automated machine tool systems that have different implications for the relative power of management and labor in the industries that might employ Noble was able to show that although the basic electronic and mechanical components of the record or playback and numerical control systems are similar the choice of one design over another has crucial consequences for social struggles on the software to see the method solely in terms of cost a cost-cutting efficiency or the modernization of equipment is to miss a decisive element in the story.

I mean on what count which select we come to a particular decision okay is also a matter of consent on what basis we build consensus what is the basis of building a consensus that is why technology is inherently political technology has inherent political properties quality okay to arrive at a consensus, consensus when we arrive at a consensus it is not a linear model rather it is not it does not have a linear process rather the process is very much dialectical in nature rather you will find the process is very much embedded in the way we give our economy culture and quality the state okay under what circumstances.

We came to a consensus that we must build to one theory dam in the context of Northwest India under what circumstances we came to a consensus that India must go ahead with nuclear first in their 70's then in the 90s and also in the 21st century that is why the process to arrive at a

particular consensus involves that in political process involves certain geological processes it is very important to understand that under what circumstances.

We came to arrive at a particular consensus, consensus it is many people may say that no it is not possible to arrive at a particular content but let me put it the other way I will say that- no it is possible it may be possible to arrive at a particular consensus but whether it is desirable to arrive at a particular consensus is a matter of question because to arrive at a consensus we variable manipulate manufacture subtle fact certain elements which go into the making of any kind of consent and such dialectical process must be kept in mind when we discuss the political nature of any technological system.

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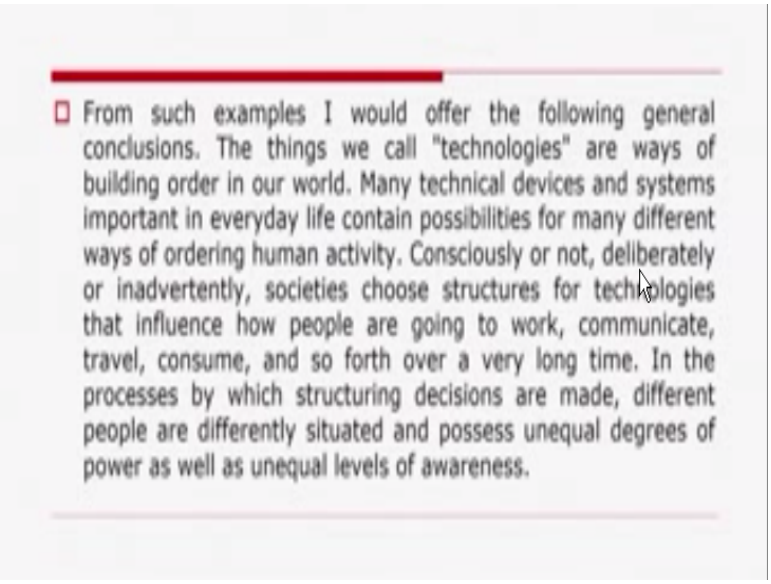

From such examples what Langdon winners offered I mean such an general conclusion the things that from the very beginning which started with that the things okay we also gave the example of puzzle in things themselves okay to the things themselves okay advantages the things that is that we call technologies or ways of building order in our world and many are orders both on both order in our world and many technical devices.

And systems important in our day-to-day lives contain possibilities for many different ways of ordering human activity consciously or not deliberately or not deliberately or inadvertently societies choose in to select structures for technology that influence how people are going to work communicate travel consume and so on over a very long period in the in the process in the

processes by which structuring decisions are made different people are differently situated and possessed unequal degrees.

I repeat different people are differently situated and projects unequal degrees of power as well as unequal levels of awareness we reach we make certain decisions and understand the powers that be it imposes those decisions on the rest of the population and those people differently located differently situated and they also possess not equal degrees of I mean they, they deposits unequal degrees of power they possess unequal degrees of accessibility they possess unequal degrees of levels of awareness.

Then how does our technology which is claimed or which is which has been assigned universally by the state be equal to different people who are differently situated possessing unequal degrees of power as well as unequal levels of awareness okay this is very important I mean if one must interrogate by far the by far the greatest latitude of choice exist the very far .

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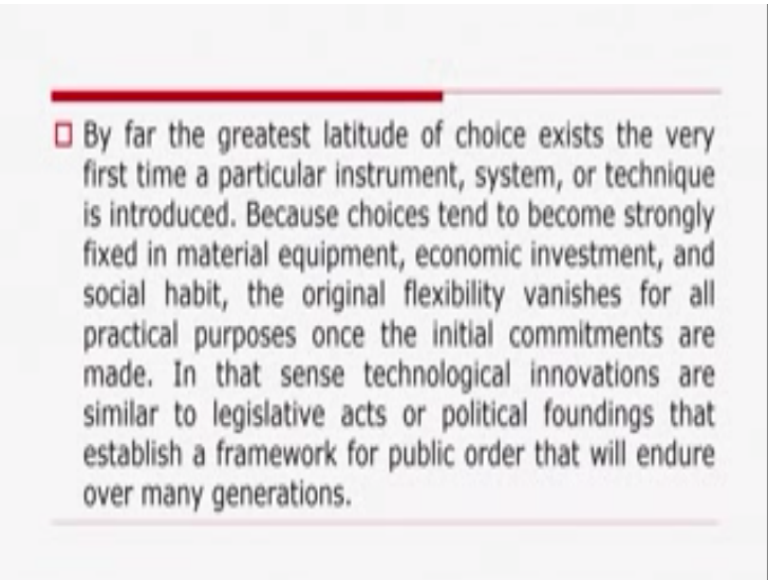

I mean exist a very first time a particular instrument system or technique in the greatest latitude of science exists the very first time a particular instrument system of technically introduced

because choices tend to become strongly fixed in metal economic investment and social habit the original flexibility vanishes disappears for all practical purposes once the initial commitment permit in that sense technological innovations are similar to legislative act or political founding.

That establish a framework for public orders that will endure over many generations then the way we make selection the way we make choices it is contingent upon material equipment economic investment social habit and soon okay because our habits are also not very personal our habits are also socially conditioned our customs are socially conditioned okay our economic investment is also conditioned or material equipments are conditioned or material positions are very much conditioned I mean they are their social construct.

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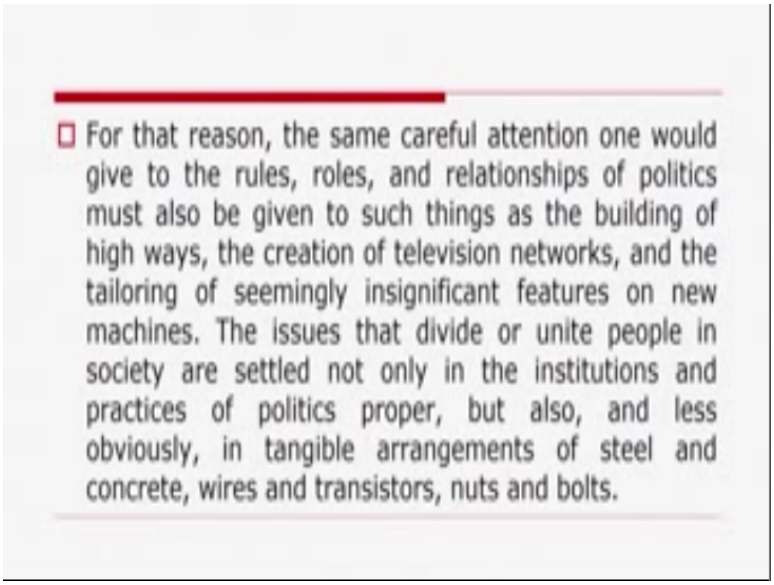

And for that reason the same careful attention one would give to the rules roles and relationships of politics must also be given to such things as the building of highways the creation of television networks and the tailoring of seemingly insignificant features on new methods the issues that divide our nice people in society are settled not only in the institutions and practices of politics proper but also and less obvious is intangible arrangements of steel and concrete wires and transistors nuts and bolts.

We must pay heed to the norms the values the rules the role the statuses and the relationships the social economic political cultural relationships institutional relationships ethical relationships legal relationships of politics which must also be given to such things at the material real it is very important this issue either divide or unite people in society are settled not only in the institutions and practices of politics proper but also and less obviously intangible arrangements of steel and concrete wires transistors nuts and bolts and so on.

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Then when we when we come to inherently political technologies we have we have what we have discussed here we have discussed technical arrangements as forms of order and then we are going to discuss length on winners reflects then on inherently political technology okay none of the arguments and examples considered thus for address a stronger more troubling claim often made in writings about technology and society above the relationship between technology and society that is the belief that some technologies are by far.

By their very nature political in a specific way according to this view the adoption of a given technical system unavoidably brings with it conditions for human relationships that have a distinctive political cost for example centralized or decentralized egalitarian or in egalitarian recessive or deliberative this is ultimately.

What is what is at stake in adjustments like those of low impose that to traditions of Technology one authoritarian the other democratic if this side-by-side in Western history then if I say authoritarian technologies are centralized technology illegally Karin technology repressive technology then democratic technologies are decentralized technology egalitarian technologies and liberating forces of production.

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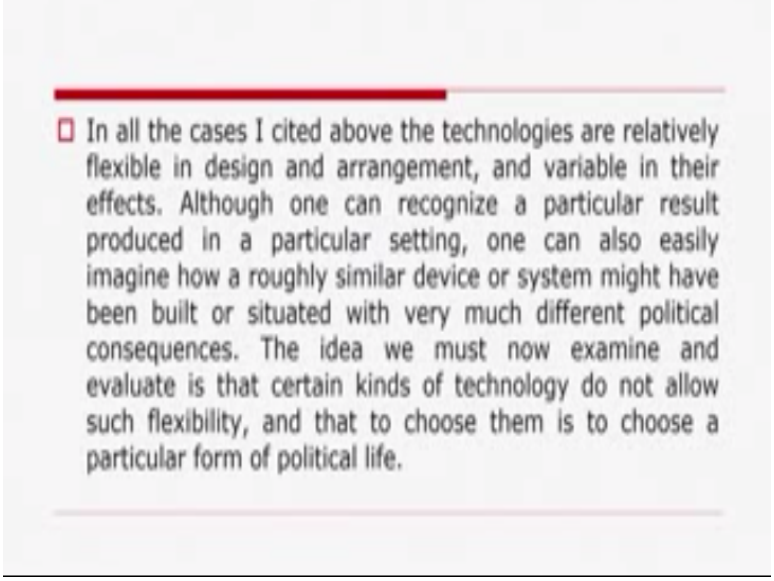

In all cases what we are sighted the technologies are relatively flexible in design and arrangement and variable in that if the first technologies are relatively flexible in design and arrangement and variable in there although one can recognize the particular result produced in a particular setting one can also easily imagine how a roughly similar device or system might have been built or situated with very much different political consequence the idea we must now examine and evaluate is that certain kinds of technology do not allow such flexibility and that to choose them is to choose a particular form of political life.

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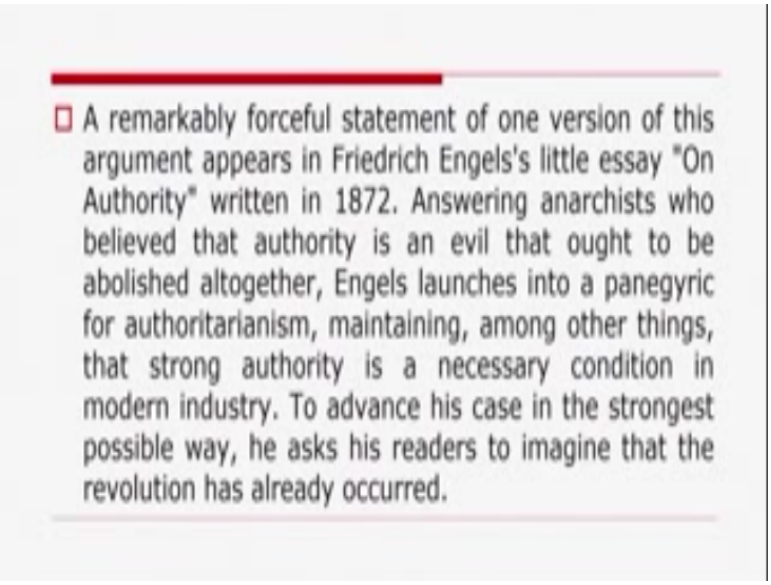

And that choice is politically socially and economically determined a remarkable forceful statement of one version of this argument appears in Engels's little essay on authority written in 1872 wrong back almost 150 years back answering an artist who believed that authorities and even that ought to be abolished altogether Engels launches into a panegyric for authoritarianism maintaining among other things that strong Authority is a necessary condition in modernist modern industry to advance things case in the strongest possible way he asks his readers to imagine that the revolution has already occurred.

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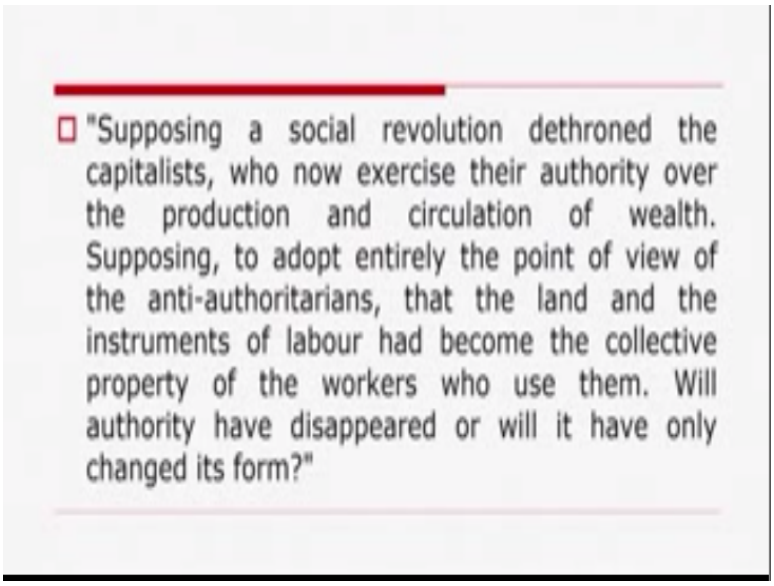

Supposing let me let me quote Engels here Frederick Engels now from his work on, on Authority supposing a social revolution destroyed the capitalist who now exercise their authority over the production and circulation of wealth supposing to adapt entirely the point of view of the anti-authoritarian that the land and the instruments of labour has become the collective property of the workers who use this will Authority have disappeared or will it have only changed it for I mean for measurement will have only changed its hands.

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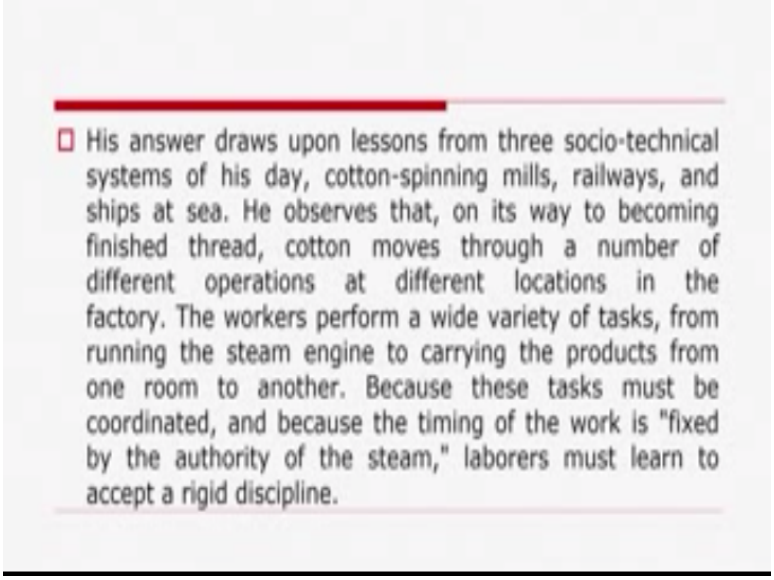

His answers draws upon lessons from three socio technical systems of history number one cotton spinning nails two railways and three ships at sea he observes Engels observes that on its way to becoming finished trade cotton moves a number of different operations at different locations in the factory the one I am not going to discuss how cotton also moves across the continuum situation colonial I mean it was done by the merchants of colonialism that is a different story alternate.

But how on its way to becoming a finished trade cotton moves through a number of different operations at different locations in the factory in the in a particular light the workers perform a wide variety of tasks from running the steam engine to carrying the products from one room to another because these tasks must be coordinated and because the timing of the work is fixed by the authority of the steam laborers must learn to accept a rigid discipline okay.

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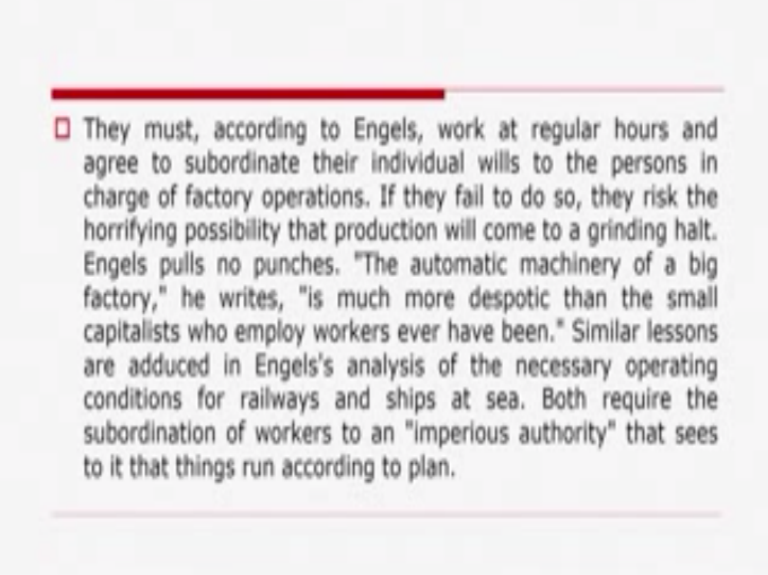

That was the arguing okay I mean here angles was trying to go beyond the conventional notion of authority then what the laborers must do the laborers must learn to accept a rigid discipline in other words the levels must work at regular hours and agree to subordinate their individual reins to the person in charge of factory operation if they fail to do so they risk the horrifying possibility that production will come to a grinding halt angle pulls no punches again, again he, he, he goes on to say.

That the automatic national machinery of a big factory here it is much more be spoke despotic than the small capitalists who employ workers ever had been similar lessons are additional Engels analysis of the necessary operating conditions for railways and ships at sea both require the subordination of workers to an imperious Authority that sees to it that things run according to plan.

And we will find that far from being an idiosyncrasy of capitalist social organization relationships of authority and subordination arise independently of all social organization and that imposed upon us together with the material conditions under which we produce a next product circulate that is what colonialism did for a pretty long period of time at least in the Indian context colonialism did it for 200 years and now also imperialism is doing the same even after 50, 70 years of Independence again Engels intends this to be Stern advice to the anarchist who according to Engels thought it possible simply to eradicate subordination and subordination at a symbol stroke sub subordination and super ordination a distinguished okay.

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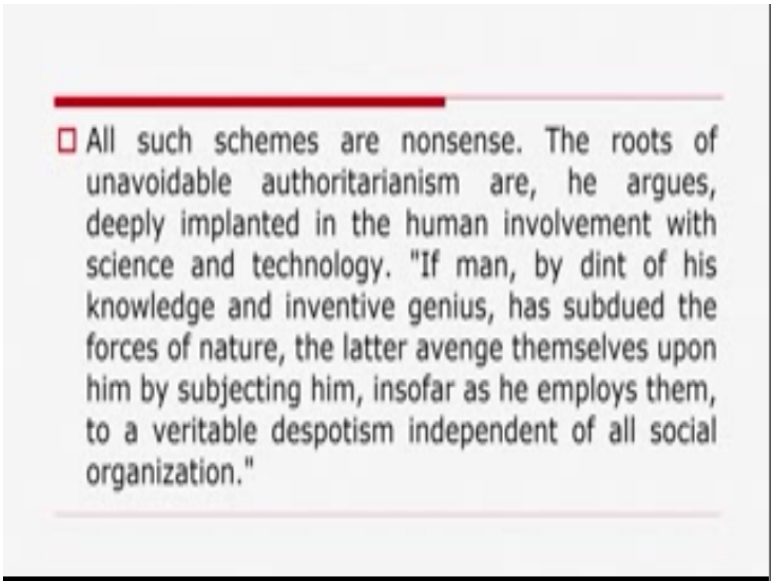

All such schemes for according to winner and nonsense they do not make sense even for angle also Spenser as even no significance the roots of unavoidable authoritarianism areas, as angles are used that are being implanted in the human involvement with science and technology if human being if an individual by dint of her or his knowledge and inventive genius has subdued the forces of nature then the natural events themselves upon her or him by subjecting her him insofar as she or he employs them to a variety of despotism independent of all social organization.

It is very important if man by dint of his knowledge and inventive genius has subdued the forces of nature the latter and nature arranges him themselves upon him by subjecting him in so far as he employs them to a variable despotism independent of all social organization.

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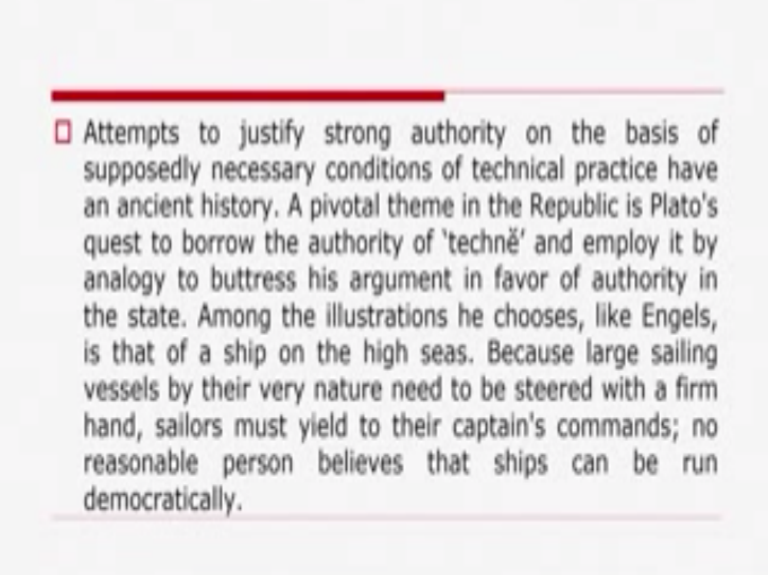

Attempts to justify strong authority on the basis of supposed he necessary conditions of technical practice have an ancient history a pivotal theme in the stem Republic is Plato's quest to borrow the authority of it means and employee by analogy to strengthen image argument to buttress the argument in favor of authority in the state among the illustrations he chooses like Engels is that of a ship on the high seas because large sailing vessels by their very nature needs to be steered with a firm hand sailors must yield to their captain's commands no reasonable person believes that ships can be run democratically.

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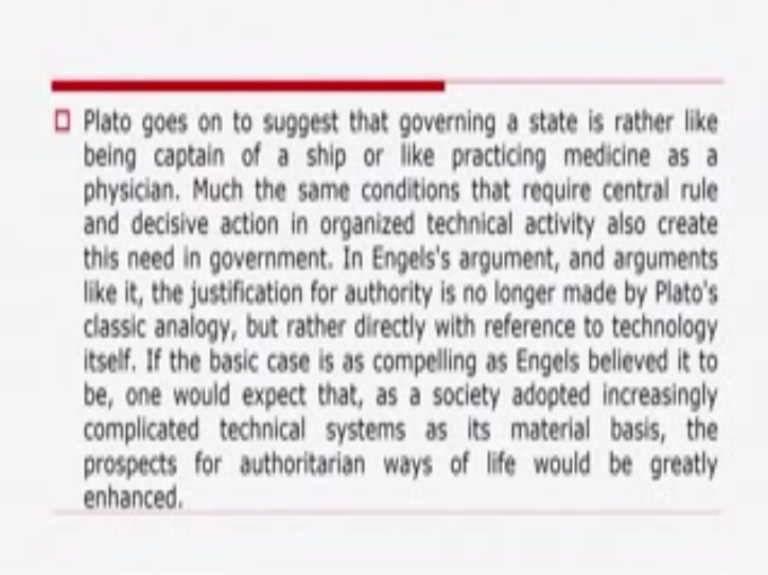

Plato goes on to suggest that governing the state is rather like being a being captain of a speak or like practicing medicine as a physicist much the same conditions that require central rule and decisive action in organized technical activity also create this need in government or state in Engels argument and arguments like arguments such as this the justification for authority no longer made by plateaus classic analogy but rather directly with reference to technology itself if the basic case is as compelling as Engels believed it to be one would expect that is only adopted increasingly complicated technical systems as a material basis the prospects for authoritarian ways of life would be greatly enhanced okay.

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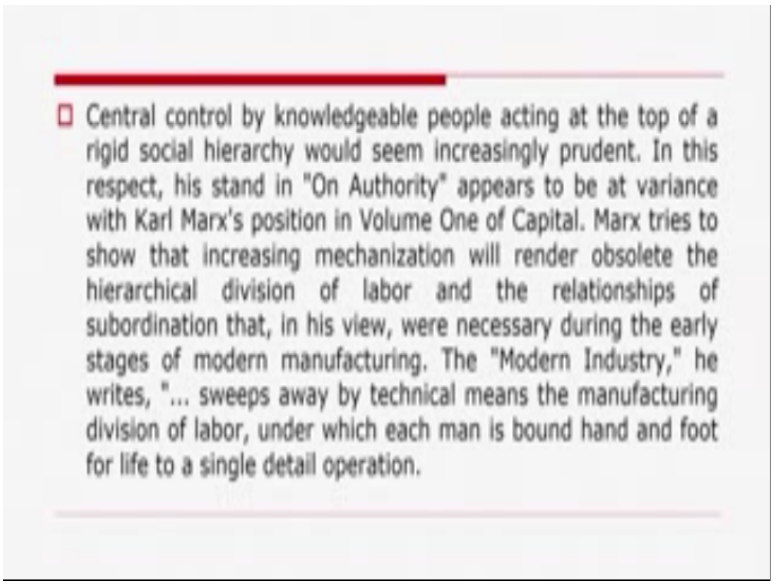

Centrally controlled by knowledgeable people acting at the top of a rigid social hierarchy would feel increasingly to date in this respect Engels standing on authority appears to be at variance with Marx's position in Volume one of capital Marx tries to show that increasing mechanization will render obsolete the hierarchical division of labor and the relationships of subordinates and that in his view where necessary during the early stages of modern manufacturing the modern industry marked right sweeps away by technical means affecting division of labor under which each man is bound hand and foot for life for single detailed operation.

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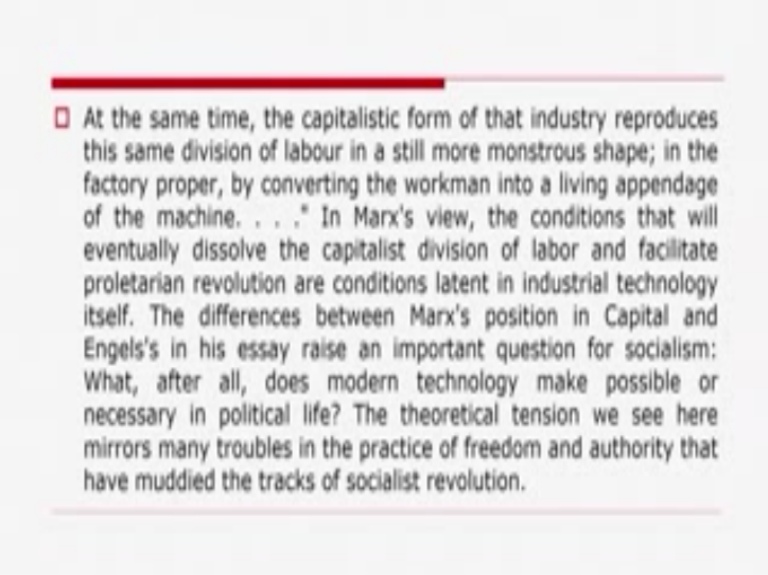

At the same time the capitalistic form of that industry reproduces this same division of labor and in specialization in a still more monstrous say in the factory proper by converting the workman into living appendage of that of the machine in masters view the conditions that will eventually dissolve the capitalist division of labor and facilitate proletarian revolution are conditions latent in industrial technology itself the differences between masters position.

In capital and Engels in his essay on authority raise an important question for socialism that is let me quote winner here at what after all the modern technology make possible or necessary in political life what after all there is modern technology make possible unnecessary and imperative in political life the political tension that we see here mirrors many troubles in the practice of freedom and authority that have muddled the tracks of socialist revolution okay.

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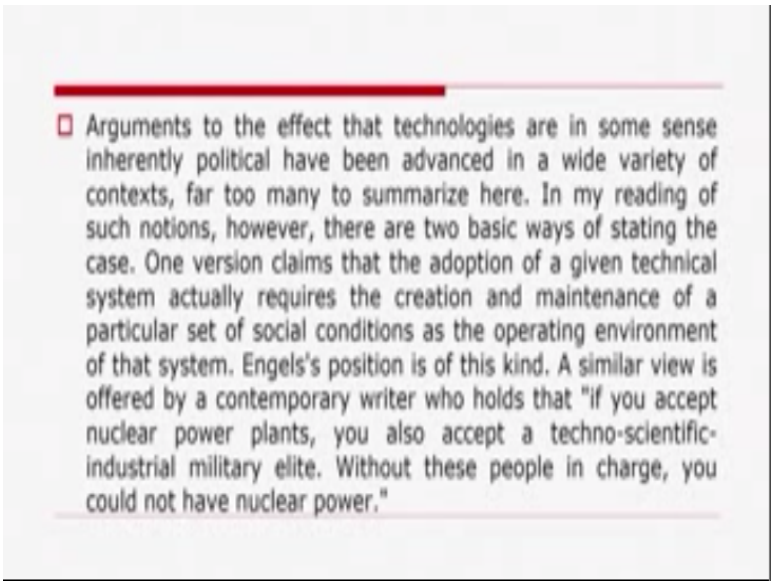

Arguments to the effect that technologies are in some ways inherently political have been advanced in a wide variety of contexts far too many to summarize shift in more in, in the reading of such motions however as winner points out that there are two basic ways of stating the case one person claims that the adoption of a given technical system actually requires the creation and maintenance of a particular set of social conditions as the operating environment of that system and Engels position is of this kind a similar view is offered by a contemporary writer who holds that if you accept nuclear power plants you also accept or techno scientific industrial military units without these people in charge you could has nuclear power okay.

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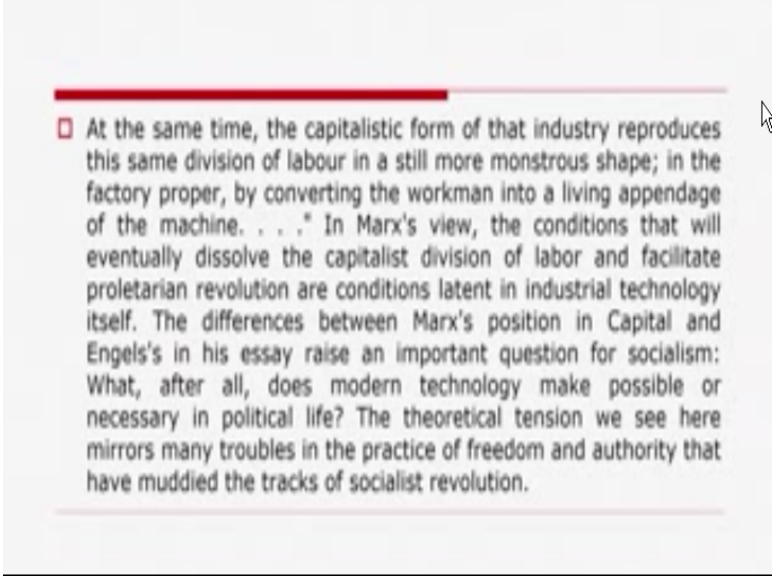

This is there is another frame of reference staying on with such dissimilarity that we find between Engels and month okay that we just now discussed how, how, how the differences between markers position in capital volume 1 and Engels any they say on, on Authority raise an important question important question for so signature that what after all does modern technology make possible for more possible or necessary or imperative in political life the theoretical tension we see here leaders many troubles in the practice of freedom and Authority that have muddled the tracks of socialist revolution.

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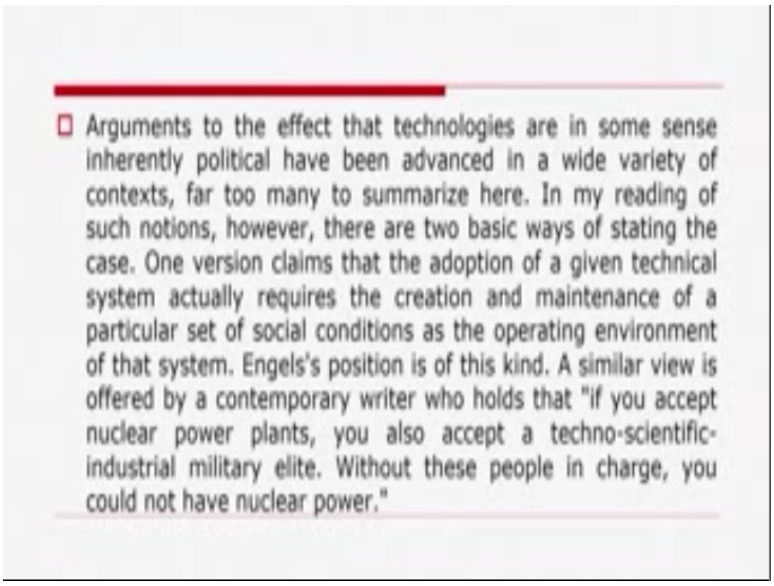

Arguments to the effect that technologies are in some sense inherently political have been advanced in a wide variety of context far too many to summarize in the reading of such notions when you point out that there are two basic ways of stating between one virtual claims that the adduction of a given technical system actually requires the creation and maintenance of a particular state of social condition as the operating environment of that system.

And angled position is of this kind a similar view is offered by a contemporary writer who holds that if you accept nuclear power plants you also accept protect no scientific industrial military elite you accept the elite of the state without these people in charge you could not have even nuclear power but it is another way.

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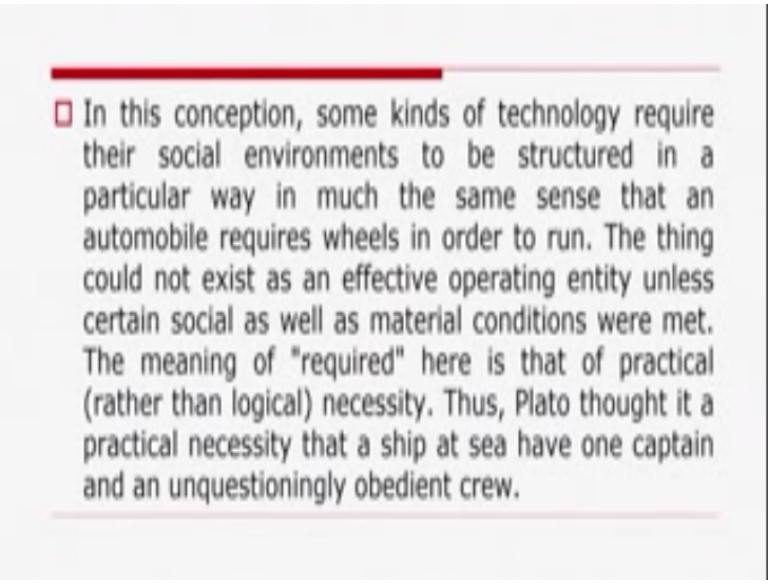

In this connection some kinds of technology require that social environments to be structured in a particular way in much the same sense that an automobile require wave in order to run the thing could not exist as an effective operating entity unless certain social as well as material condition segments the meaning of required here is that of practical rather than logical necessity okay the practical necessity next cycle building consensus is become more practical rather than logical necessity thus Plato thought it practical necessity that a ship have one captain and unquestionably, unquestioningly obediently crew okay.

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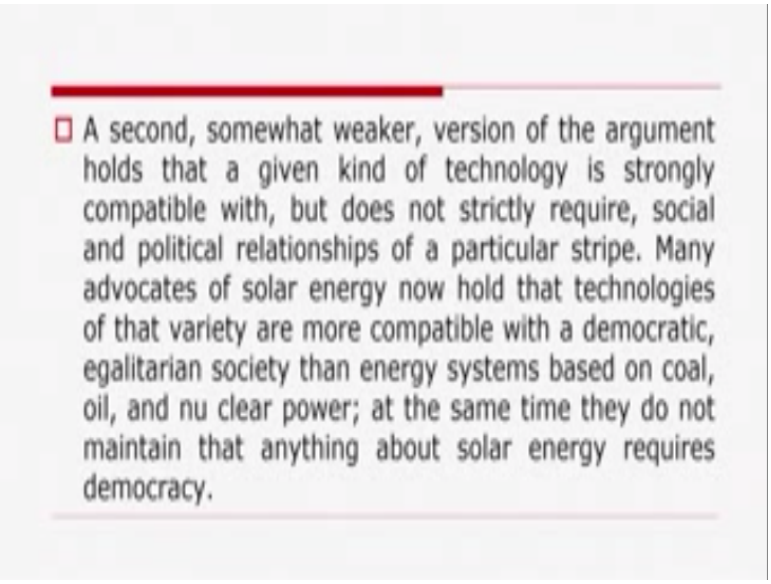

Let us what authoritarianism a second somewhat weaker version of the argument holds that given a kind of technology strongly compatible with but does not strictly require social and political relationships of a particular strike many advocates of solar energy now hold that technologies of that variety are more compatible with a Democratic egalitarian society than energy systems based on coal oil and nuclear power at the same time they do not maintain that anything about solar energy requested democracy that is the problem okay.

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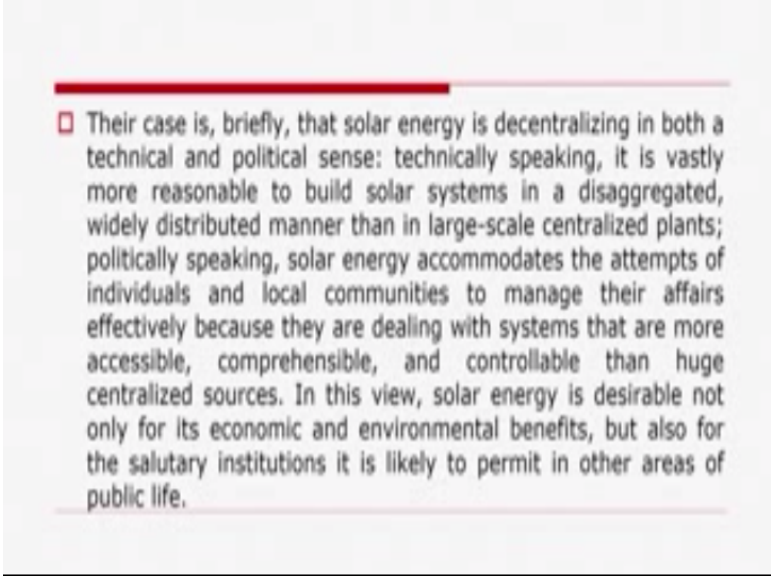

That case is briefly that solar energy is decentralizing in both technical and political first technical sense than politics first one technically, technically speaking it is vastly more reasonable to build solar systems in a disagree gated widely distributed manner than in large scale this large-scale centralized squared secondly politically speaking solar energy accommodate the attempts of individuals and local communities.

To manage their affairs effectively because they are dealing with systems that are more accessible comprehensible and controllable than huge centralized sources in this move solar energy is desirable not only for its economic and environmental benefit but also for the salutary institution cities like this to permit in other a range of public life okay.

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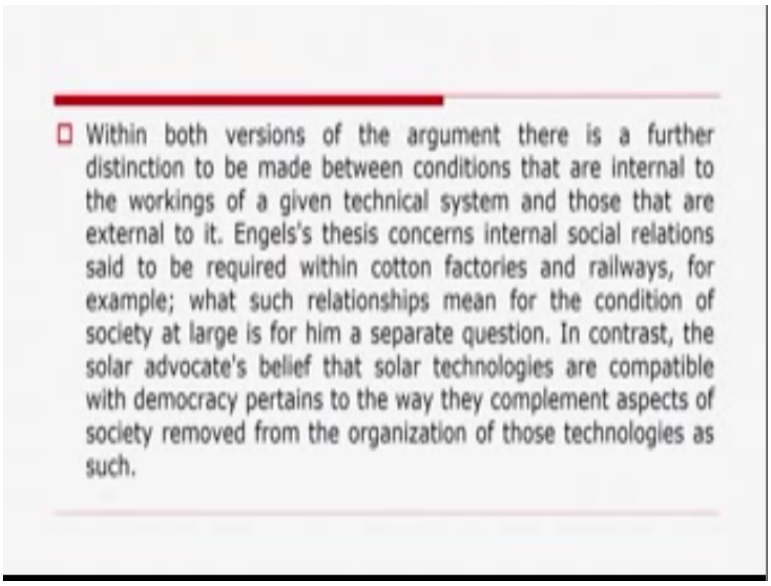

This is very important in the context of alternative knowledge systems alternative technological systems within both versions of the argument there is a further distinction to be made between conditions that are internal to the workings of a given technical system and those that are external to the given technical system Engels this is concerned internal social relations state to be required within cotton factories and railways for example what is the true relationships mean for the condition of society at large is for him a separate question in contrast the solar advocate belief that solar technologies are compatible with democracy pertains to the way they compliment aspects of society removed from the organization of those technologies as such.

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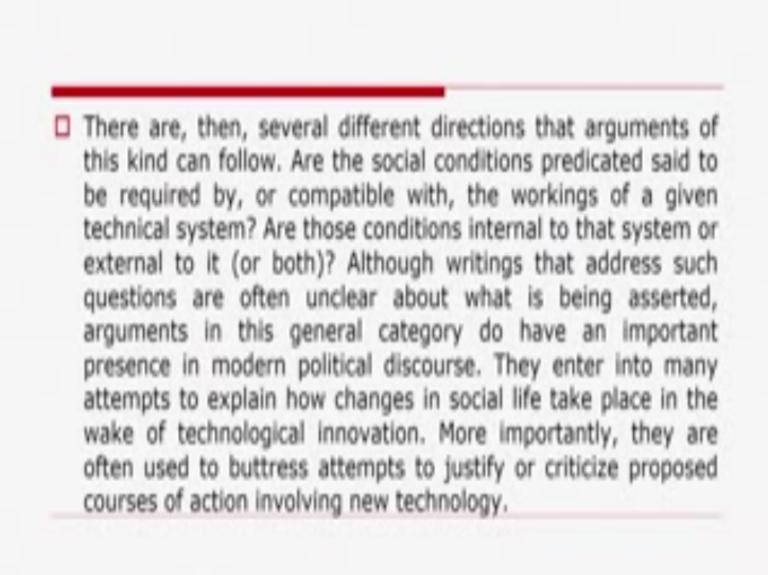

This is a classic, this is a classic exhibits and demonstration of internal to the workings of a given technical system as well as external to the workings of a given game in contrast there is then several different directions that arguments of this kind can fall under social conditions predicated said to be required by or compatible with the workings of a given technical system are which conditions internal to that system or external to those that system or both internal as well as external.

To those systems although writings that address such questions are often unclear about what is being adjusted are women still this general category do have an important presence in modern political discourse they enter into many attempts to explain how changes in social life takes place in the wake of technological innovation more importantly they are often used to still then but case the attempts to justify or criticize proposed courses of action involving new technology.

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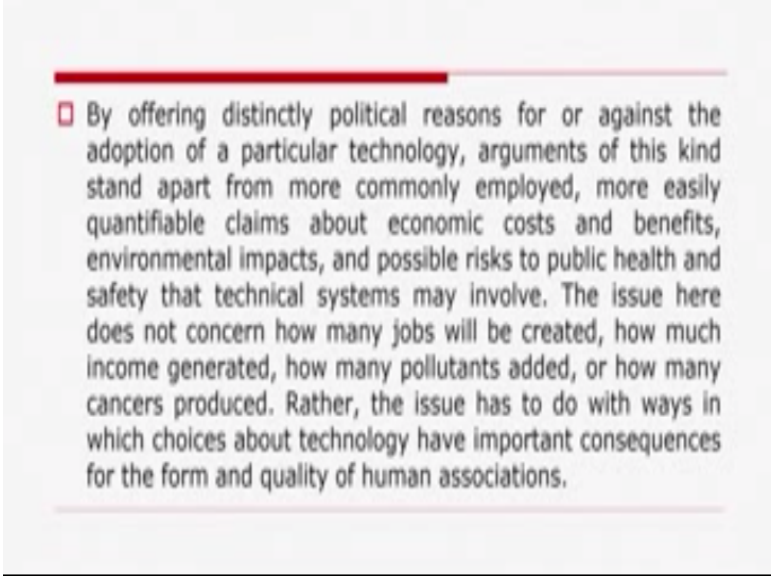

By offering distinctive political reasons for or against the adoption of a particular technology arguments of this kind stand apart from more commonly employed more easily quantifiable claims about economic costs and benefits, benefits environmental impacts and possible risk to public health and safety their technical systems may involve but this means this such binary positions must be done away with such binary positions are inherently political in nature and inherently whimsical in nature even, even, even beyond whimsical in nature suppose in the context of and 911 situation the northern President of the United States of America spend either you are with us always terrorists such, such binary policy must be done away with must begot rid of okay.

In the, in the context of technology which is inherently political we cannot have such binary positions let us say by offering by providing such distinctive political reasons for or against the adoption of a particular technology arguments of this kind stand apart from most commonly employed more easily quantifiable theories about economic costs and benefits environmental impacts and possible risks to public health and safety.

That technical systems may involve the issue here does not concern how many jobs will be created how much income generated how many pollutants added on how many cancers produced rather the issue has to do with ways in which choices about technology have important consequences for the form and quality of human associations if we examine social patterns that comprise the environments of Technical Systems we find certain devices and systems almost

invariably linked to specific ways of organizing power and authority the important question is does the state of affairs derive from an unavoidable social response to injectable proper time in the things themselves.

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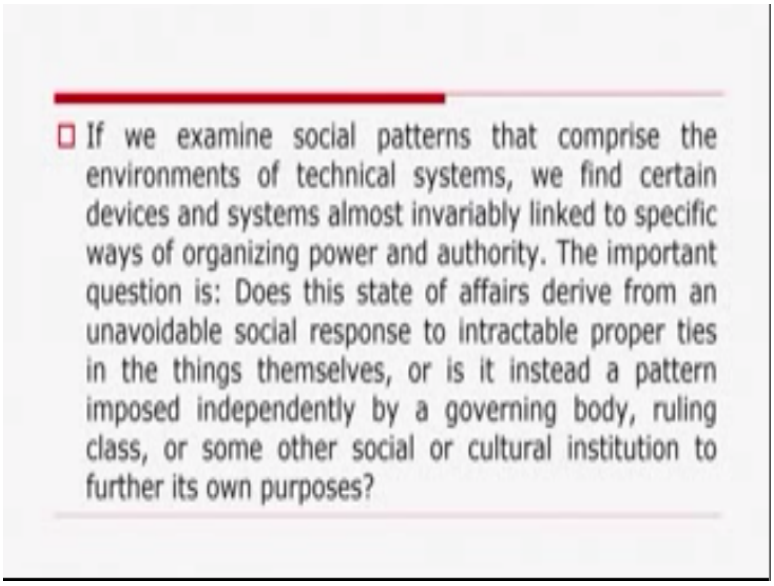

Or is it instead of pattern imposed independently by a governing body ruling class or some other social or cultural institution to further its own purposes I repeat the question that, that, that we find certain devices and systems almost invariably linked to specific ways of organizing power and authority I mean the question is does the state of affairs derived from the unavoidable social response to in taxable proper time in the things that the things I need technological artifacts themselves or is it instead of patterning post independently by a governing body ruling class or some other social or cultural institution.

To further its own agendas but taking the most obvious example the atom bomb is an inherently political a defect as long as it exists at all its metal properties demand that it be controlled by a centralized rigidly hierarchical chain of command close to all influences that might make its working unpredictable look at the second world when it has a technological artifact was used in such a manner that the internal social system of the bomb must be authoritarian.

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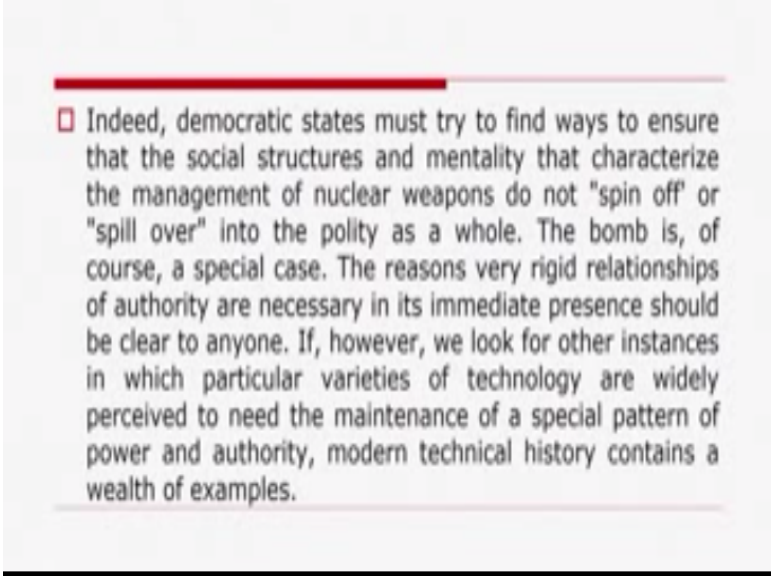

There is no other way the state of affairs stands as a practical necessity independent of any larger political system in which the bomb be invaded independent of the kind of regime or character of it foolish indeed democratic states must try to find ways to ensure that the social structure and mentality that characterize the management of nuclear weapons do not spin off or spill over both spin-off or spillover into the quality as a whole the boundaries of course of special case.

The reasons very rigid relationships of authorities are that is the reason being very vivid relationships of authority are necessary in its immediate presence should be clear to anyone If however we look for other instances in which particular varieties of Technology are widely perceived to need the maintenance of a special pattern of power and authority modern technical district contains of wealth of examples.

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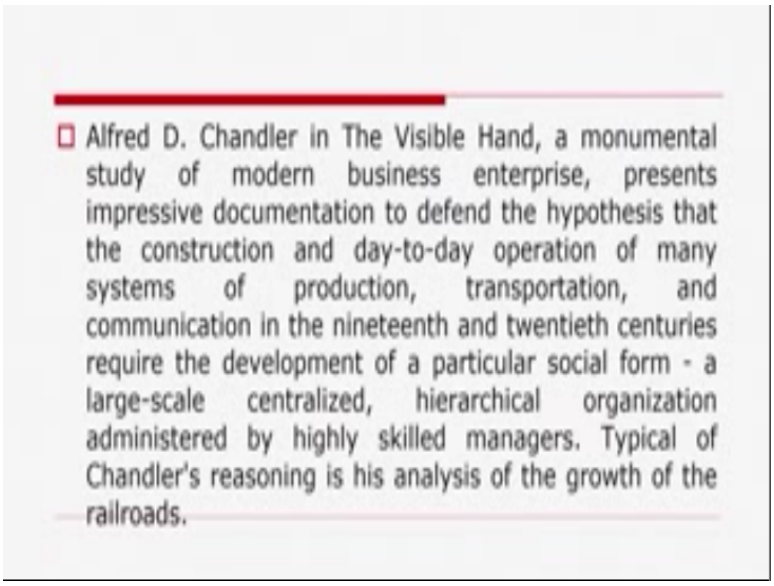

Alfred D. Chandler in the invisible hand on one mental study of modern business enterprise present impressive documentation to defend the hypothesis that the construction and day-to-day operation of many systems of production transportation and communication in the19th and 20th century requires the development of a particular social forma large-scale centralized hierarchical organization administered by highly skilled managers typical of Chandler's reasoning is his analysis of the growth of the railroad okay.

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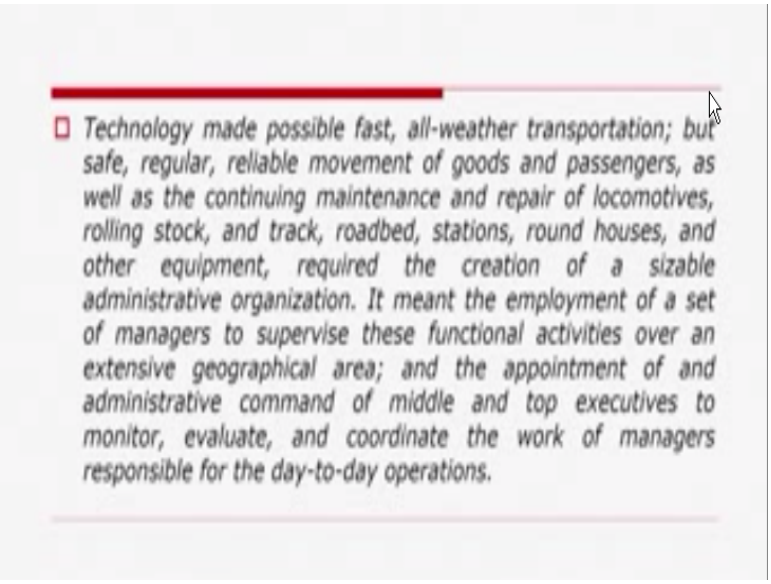

Let me quote Chandler here he said meta technology made possible first always the transportation but safe regular reliable movement of groups and passengers as well as the continuing maintenance and repair of locomotives rolling stock and track road big stations round houses and other equipment required the creation of a sizable administrative organization it meant the employment of a set of managers to supervise these functional activities over an extensive geographical area okay and the appointment of an administrative command of middle and top executives to monitored valuate in coordinate the work of managers for the day-to-day operations.

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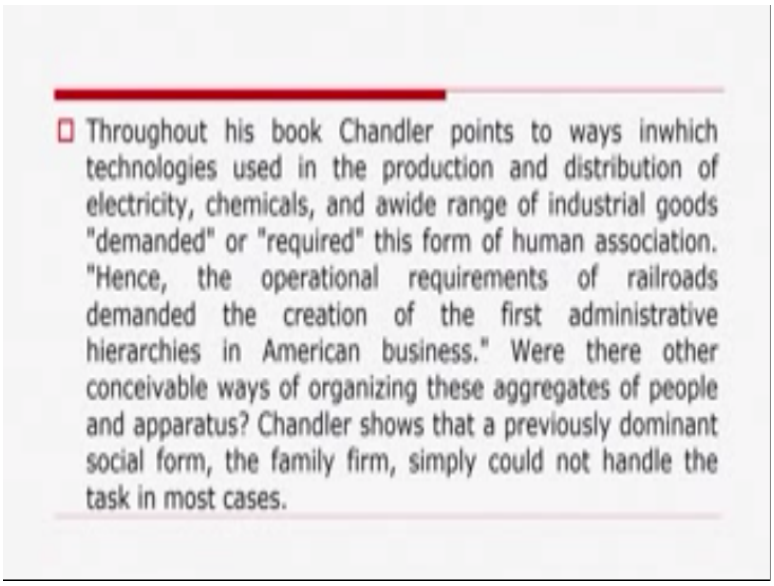

Throughout his book Chandler points to ways in which technology is used in the production and distribution of electricity chemicals and a wide range of industrial goods demanded or required this form of human association hence the operational requirements of railroads demanded the creation of the first administrative hierarchies in American business whether other conceivable ways of organizing these aggregates of people and Africa to Chandler shows that a previously dominant social form the family form industry family form simply could not handle the task in most cases.

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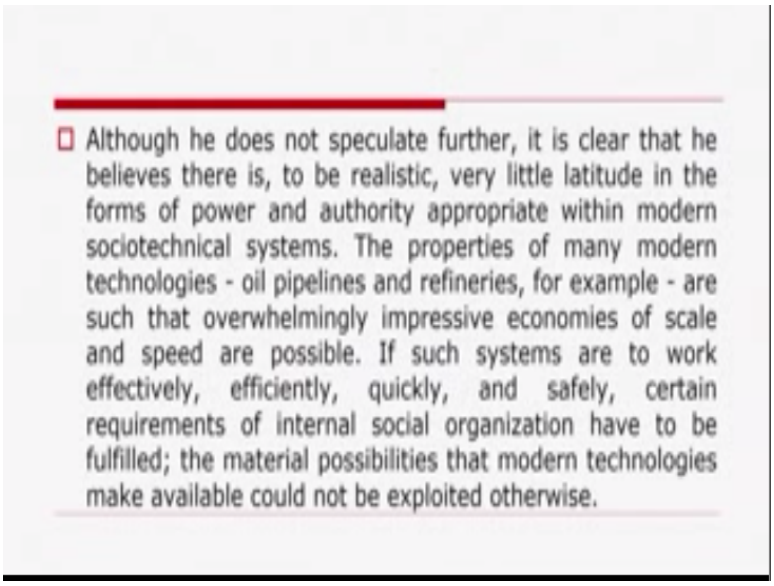

Although Chandler does not speculate further it is clear that the belief there is to be realistic very little latitude in the forms of power and authority appropriate within modern social technical systems the properties of many modern technologies oil pipelines and refineries for example are such that overwhelmingly impressive economies of scale and speed are possible if such systems are to work effectively efficiently quickly and safely certain requirements of internal social organization has to be fulfilled.

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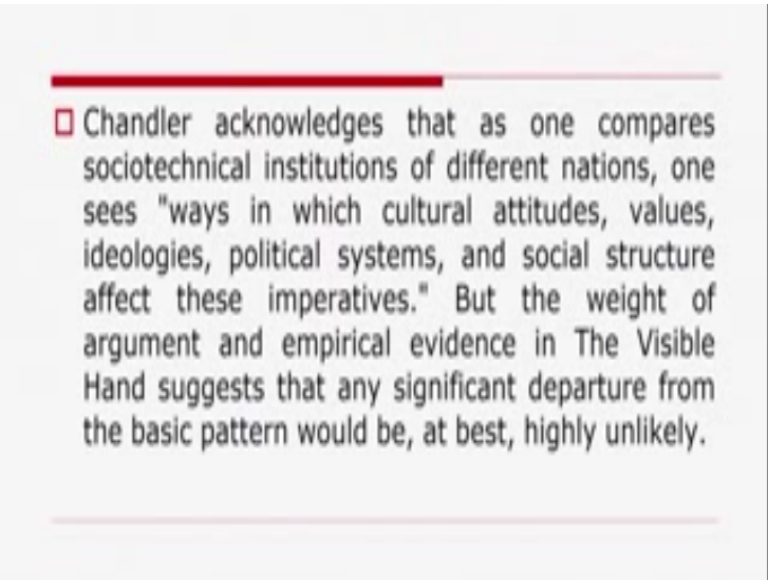

The material possibilities that modern technologies make available could not be exploited otherwise Chandler recognizes that as one compared socio technical institutions of different networks Chandler acknowledges that as one compared socio technical institutions of different lessons one speeds ways in which cultural attitudes values ideologies political systems and social structure effects these imperatives but the width of argument and empirical evidence in the visible hand in suggests that any significant departure from the basic pattern of the based highly unlikely.

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