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Science, Technology and Society

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When we discuss the technological shaping of technology we have discussed the critics on the inspirational notion of invention in the form of opponent use, then for the perspective on HTS this economic shaping of technology when we talk about.

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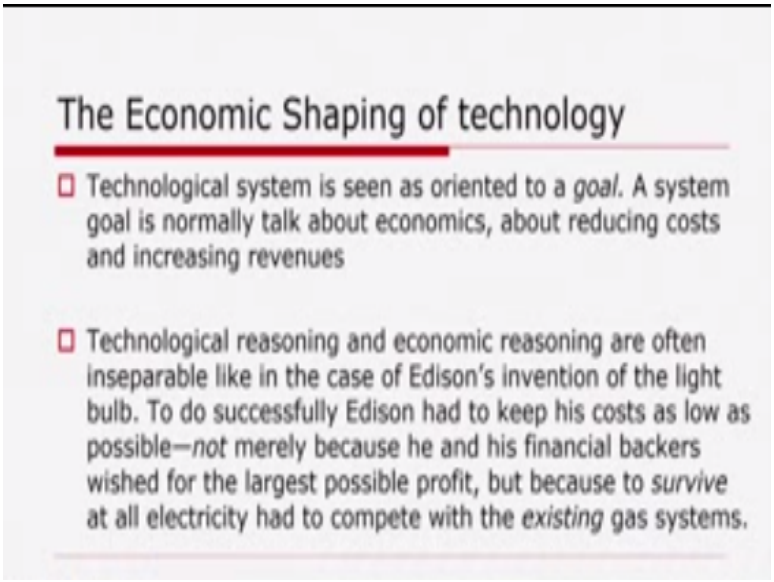

I mean from the technological shaping of technology we will come to economic shaping of technology. The very concept of river silent makes only a technological system is seen as oriented to a goal. See in economy, in evolution of technology economics if deeply embedded, economic goals are deeply embedded okay. Asuk pointed out that the technological system is seen as oriented to a goal to an objective, to an aim.

It must aim towards certain social needs or economic needs or by keeping the market in mind okay. Otherwise, any metaphor or advancing are of backward parts become meaningless. Language of this kind of dangerous, if it is allowed to slip towards way to talk of the cultural need for a technology okay. But the notion of a goal can be given a diet in doubt worth meaning.

Most importantly a system goal is normally talk about economics, but reducing costs and increasing revenues. I mean talk of a system goal is normally talk about economics about reducing costs and increasing revenues. For example, electricity supply systems for example, had been private or public or the prices and those who have run them have inhabitable they concerned above all about costs, profits and or revenues or loses and so on.

The river salient is in efficient or uneconomical component for use, for Thomas use and for many practical purposes inefficient means uneconomic, that is what I mean, that all given so far as practicality is concerned, practical constitutions have concerned okay. What is efficient, what is efficiency means economical, inefficiency means uneconomical okay, for the time being. Now we can want to argue that efficiency maybe uneconomical, inefficiency maybe economical okay.

We will see that in the lecture of the whole okay. I mean technological reasoning and economic reasoning are often inseparable like in the case of Edison's invention of the light electric bulb, or extract from huge so on okay demonstrate this in the case of Edison's invention of light bulb okay. Edison was quite consciously the designer of a system, he intended to generate electricity okay, transmit it to consumers and to see them the apparatus they needed to make use of.

To do so successfully Edison had to keep his cost as low as possible not nearly because he and his financial bankers reached for the largest possible profit, but because to survive at all electricity had to compete with the existing gas systems okay.

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Crucially Edison believed he had to supply electric light at a cost at least as below as that at which gas light was supplied, these economic calculations enter directly into his work on the light bulb, a crucial system cost river salient was the copper for the wires that conducted electricity, less copper could be used in these wires had to carry less current simply, but crucial science was available to Edison as a resource, what are those?

I mean Ohms and Joules laws from which he inferred that what was needed to keep the current low and the light supplied high was a light bulb filament with a high electrical resistance and therefore, with a relatively high voltage has compared to current. Having thus determined economically as well as rather economically as much as technologically its necessary characteristics finding the correct filament then became a matter of hunting craft okay.

The presage characteristics of the Edison is are perhaps untypical, even in his time Edison was unusual in his concise individual rasp of the nature of technological systems they are in perhaps they success. And since his time the inventor entrepreneur has in many areas been over said out by the giant corporation which research and development facilities. Manual park, I mean that was Edison's RND institution research and development institution was only an aspect of the beginning of the day transformation brought about by the large scale systematic harnessing of science and technology to corporate objectives.

But the essential point remains typically technological decisions are also economic decisions. If we produce a technology, if we design a technology which is not marketable which consumers

are not interested in, then perhaps it will explore very soon okay. If technological systems, I mean if technological systems are economic under prices and if they are involved directly or indirectly market competition, then technical changes forced on them if they are to survive at all much less to prosper, they cannot forever stand still okay.

Paradoxically the compelling nature of much technological changes best explained by seeing technology not as outside of society, I mean in the context of hierarchical or linear model as well as interactionist model we have seen, I mean all science and technology, science technology and society were separate entities. But in the case of embedded model we have witnessed how science and technology are very much a part of social institutions okay.

That is why the compelling nature of much technological change is just explained by seeing technology not as outside of society as some persons of technological determinising would have it but has in next work ably part of society, that is why I repeat if technological systems are economic enterprises and if they are involved directly or indirectly in market competition okay then technical change is forced on it okay.

Technical change is made inevitable and it is I mean if they are to if such technological systems if such technological systems at survive at all much less to prosper okay, leave them whether they prosper or not but if they have to survive okay they cannot forever stands still okay that is why economics applying of technology is also important is assuming later significant sin this context okay. Technical change is made inevitable and its nature and directs and perform conditioned by this.

And when national economy is are linked by a competitive world market as they have been at least since the mid 19 century technical change outside a particular country can exert massif presser for technical change inside.

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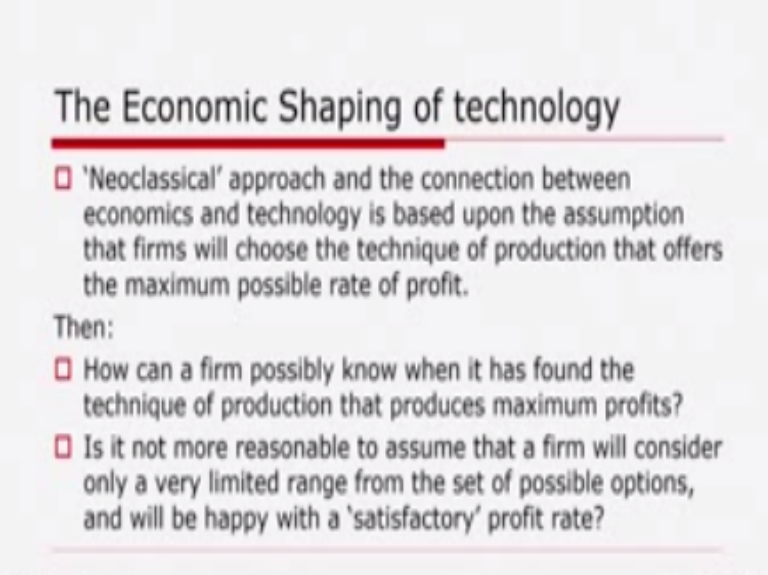

The dominant way of thinking about the connection between economics and technology okay is the neoclassical approach okay. Which is based upon the assumption that forms will chose the technique of production that offers the maximum possible rate of profit okay, I mean if you look at a basic economics text books up to earth sessile bogie I mean 1910 20's and not even 20 up to by 19920 we consider it is a nucleus grillage from John Menard Kins the general theory of employment in resistant money, we come to know that it is the modern economics okay.

But this is not a part of the course I am just giving you some example who ever maybe interested in economics okay. That is why the neoclassical approach I mean the dominant way of thinking about the connection between economics and technology that is the neoclassical approach which is based upon the assumption that forms will select the technique of production that offers the maximum possible rate of profit.

Despite its apparent possibility this assumption has been the subject of much criticism with in economics okay these issues involved the complex there is a useful review of them later on I mean for a example by Ulster in 1983 but the in Japan whether human decision making does or indeed could conform to the strict requirement of the neoclassical model for example how can form possibly no it has found the technical production that produces maximum profits, is it not me a reasonable to assume that a form will consider only a very limited range a few range from the set of possible options and we will happy with the satisfactory profit rate.

Or not necessarily I mean no only satisfactory not maximum okay, in the new approaches that are developed within economics inspiration has been found in the work of Josephs Soviet okay, with its emphasis on the aspects of innovation that goes beyond and cannot be explained by rational calculation okay. That is why we a times a theoretically speaking one may say that another premier and or an investor must look at the maximum profit but how can an individual how can an anther prenour how can an innovator how can an investor how can a form how can an industry possibly no when it has found the technique of products and that produced maximum profits we do not know we just an assumption.

Rather instead of making such rational calculation we are trying to look at some kind of satisfactory profit rate instead of maximum profit okay, it is found in the works of even Sumpetor who was the first one who was perhaps one of the fast ones to offer the theory of innovation in economics and which transcends economics is which goes beyond the preview of economics I man we socialist also study a sum pet in the context of social innovation.

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Therefore when you know when social when you know western transcends the field of economics it push to the level of culture society polity and so on therefore we say economic shaping is social shaping what are the sociological explanations for this okay the alternative neoclassical economic of technology that offers direct breeze to more sociological explanations what are those sociological explanations? I mean costs and profits matter is enormously but in situations of technical innovation key factors are future costs and future profits.

Since there is an element of uncertainty in these they cannot be taken a simple given facts estimating costs and profits is part of what law calls okay, heterogeneous engineering okay what is that heterogeneous engineering? What are these sociological explanations for this? when we say heterogeneous engineering I mean engineering social as well as technical phenomena that is why whenever we said technology, technology always socio technical in nature and social and technical are inseparable okay.

Constricting that heterogeneous technology okay that is engineering which is social as well as technical okay or technology which consists of both social as well as technical phenomena constructing and environment in which favored projects can be seen as viable okay. in this context market process one is those who get this wrong enjuvad those who get this right but reach out, outcome will prevail cannot be known with certain t not ones nor can it be assume that market process will eventually lead to optimal behavior as successful strategies are rewarded by the difference in growth of forms that perceive that.

That is tended neoclassical argument may have validity for static environments in which selection as a long time to exercise its effects but not for situations of technological change is strategy that succeeds at one point in time may fells shortly thereafter a strategy that succeed at one point in time I repeat the may fail shortly thereafter and the markets in visible hand may simply have insufficient time for the neoclassical economists optimization to take this.

Furthermore even if sure calculation of costs and benefits or profits and even optimization where possible the economic shaping of technology would still be its social shaping economic calculation and economic laws after all specific to particular forms f society not investment suppose I will discussed the signing whenever you are talk about economic calculation or economic laws there very much context specific.

To a particular form of society when we were people where engaged in economic calculation and economic laws religion due you place the same process of the economic calculation and economic laws will capitally are we going to do the same in the context of socialistic okay, I mean every in all societies have to tried to recall the costs and benefits of particular design decisions and technical choices.

The form taken by that recovering importantly variable I mean it is economic calculations, economic laws their not universal phenomena there context the city there ,specific to particular forms of society or their specific to particular moods of production for example technical innovation in the east while.

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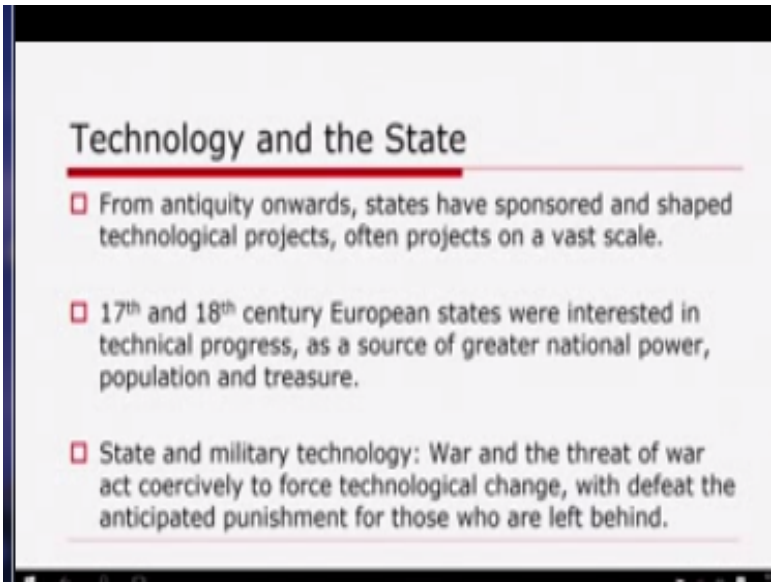

Okay people there I mean people in the east while so faith is a user their certainly made calculations to what suffer the economic interest and plant managers had greater ,autonomy to make decisions they need opinions but the frame work of that calculation was different prices were set by central planners of the state prize committee rather than being subject to the vacancies of the market has in the west.

Or even in the Indian context okay, today Indians state digit determine we do not have price stabilize in mechanism rather we lived to the verbiage weather or the verbiage of the corporate set okay, if may in the contest of medicine, in the contest of agriculture also oaky, it price we might say was thus the different social religion in the society in it is classical form.

The system of rewards to show outs the mangers hence upon quantity of production in the short term fulfilling the nuns plan in the current quantity I mean focus on quantity implied that while small technological innovations might be welcome larger changes for example changes that meant elaborate read thoroughly where a authored developing a new product meant routine sweets little promise commentary word in successful.

The reform that then so diverged leaders introduce to elevate this situation now often merit was thus economic reforms in 1965 tied the rewards towards managers more closely to the profitability of their entrepreneurs but because the price system was not fundamentally changed the British profits could be earned by concentrating on exciting products huge costs of production be earned by concentrating on.

I mean which costs of production had fallen well below that zero metrically settings innovations instead of speeding up actual slot and the consequences contributed to the eventually dramatically also mathengen walkman book further more evenly we restrict over attendance to societies in which price is reflect market competition we find that economic calculation reminds some.

Mechanism of socialism okay, while you because it is specific to particular forms of society to particular moods of products economical calculation pre-supposes structure of cost that is used has it buses ,has it foundation but a cost is not an isolated arbitrary number of pounds of dollars it can be affected by and itself affect the entire way of societies organist this point emerges most sharply when we consider the cost of labour whitely technical changed because much innovations sponsored contract rewind and justified on the grounds that it saves labour cost .

Okay to a classic example because of the difference circumstances of 19th century British and Americans societies such has the regions of the USA of a plenty of agricultural land which honestly by individuals peoples was largely dis regarded labour costs more America than in

British hence Amehooke in 1962 argued that there was a much greatest stimulus in America than in written for such labor inverses.

And thus different pattern of technological change that we find into societies British and Americas okay, I mean Amehooke clean as in a fact proving in contract over's the oaky, but the general point reminds the way of the societies, or vantages the way a societies instituted okay and it is overall circumstances, overall conditions affect it is typical pattern of costs does the nature of technological change into that individuals.

Are typically paid, I mean you will also find historically and even toady you will find it that may not typically paid more than women for example, is clearer not an amatory matter but one that reflects deep sited social advances and an enhanced the religion of labour including unequal domestic and child labour responsibilities then do not think that it is admiralties I mean typically paid more than women.

It is not arbitrary it reflects deep suited social a deepest social assumes deep rooted social, assumption and enhanced division of labour including unequal domestic and child labour rarely responsibilities the different cost of men and women's labour translated into different economics thresholds the missions that have to justify their costs by elimination of main sort of women's tasks are mechanism of the genders setting of technology.

That deserves systemic study I mean we must discussed this when we come to technology and gender within social setting of technology now let us when we sat that technical innovation includes economically calculation ,economics laws which are after all specific to particular forms of society more of production there not universal okay, technical for example, technical innovation in the east while so with union users then what is the nature of the state so for technologies I mean that is why we come to a point of technology and state from I mean social relations, social relations then affect technological change.

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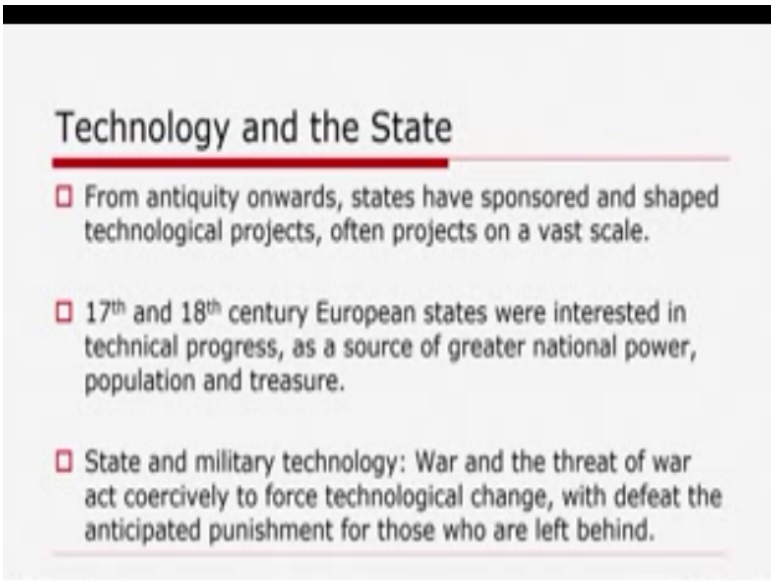

Though the way that they shape the favor of market calculations but the market is far from the only social legislation that shapes technological change from antiquity onwards states are sponsored in set technological projects often projects and a vast scale that is why we can look at any approaches some dam projects on electricity it projects on water projects on I mean large scale technological projects okay.

If you look at if you can slightly recall what we discussed in the political contextual of technological systems in the war and the threat of minimum 4 authority and democratic technologies authoritarian technologies are more often proposed by offended by set by sponsored by the state okay more fold provided a classic account of this we take coaching he said that authoritarian techniques it begins on the 4th millennium busy in a new configuration of technical invention scientific observation and centralized political control.

The three things here technical invention one scientific observation and centralized political control by this state but new authoritarian technology was not intended by village costumer human sentiment it is highly influenced of mechanical organization listed on route less physical co official state co official forces labour and slavery which brought into existence human power machines that are capable of exiting thousands of horse pound okay.

17th and 18th century European states were interested in technical progress as a source of later national empower population and crisis okay this martatalist farmer then what is mart list farmer now the state and military technology I mean greater national empower population and treasure okay this margantist famor carried different implications for the settling of technology and in the state and military technology when we talk about I mean it is the war and or the threat of the war.

They act perceively to force technological change with defeat the anticipated accomplishment for those who are left behind and then when I say this mercantilist such mercantilist farmer for having greater national power population and treasure carry different implications for the settling of technology than the strict forwardly capitalized judgments while in England there was strong commitment to power saving devices in France.

The merchandise knows that in war must be found for the largest number of hands found behind as well it is 1784 the boutique room was held in France because it employed price as many workers as the pen cloth room okay it mean argued that it was the benefit of labour which remains in the towns when the products have left that is the real product of the manufacturers.

That the simple most important way that the state has set technology has been through its sponsoring of millions of it that is how we come to the state a military war and its threat of or the war of are war and its preparation have probably and its preparation have probably seen and probably been on a power weight economic considerations factors in the history of technology

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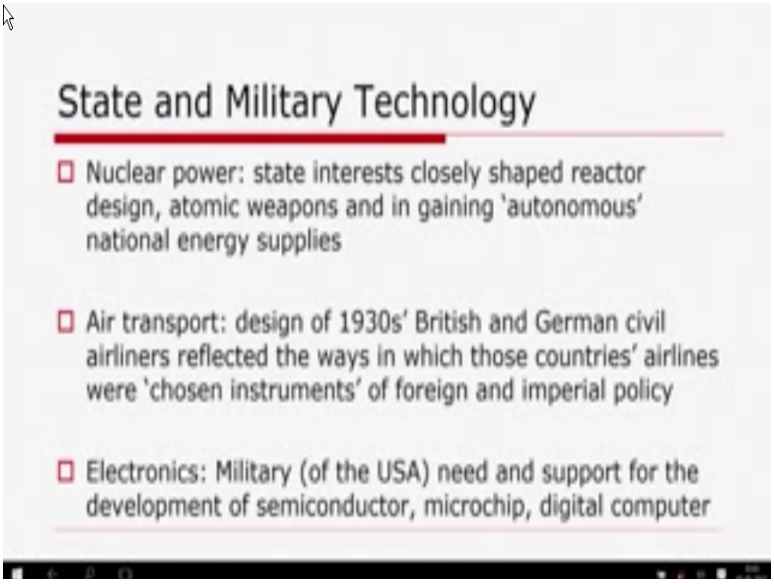

Like you will find that like international become an competition war and the threat of war act progressively to force technological change which defeat at the anticipated punishment for those who have left behind okay.

The military technology is the subject of a subject okay that I mean the military technology when we talk about the extent to which military consumes of set civil in technology military interest in new technology has often being cuisine in overcoming what might otherwise have been in suitable economical barriers to its development and adaption and military consumes often set the development pattern and design details of new technologies okay. We can give up we can keep on giving such examples okay.

I mean the case of nuclear power and in state interests closely shaped reactor design, atomic weapons and in gaining autonomous national energy supplies we can give case studies like air transport where we will find design of 1930s which is in journals civil airlines reflected the range in which huge countries airlines were choose an instrument for foreign and imperial policy okay.

That is a colonialism operated for a long time and through military technology colonel ruled us ruled India for almost a couple of centuries in the context of electronics we will find military I mean in the US need an support for the development of the semi conductor micro chip digital computer and so on okay then when we start to I mean these are certain range to look at the nature of much dependence of technological change okay.

When we look at neurology the relationship between technology and society okay its major development in the social studies of technology since the first edition of the such work that I mean the science technology and society studies reader can affirm then in 1955 is the flowering of the theoretical war on the relationship between technology and society.

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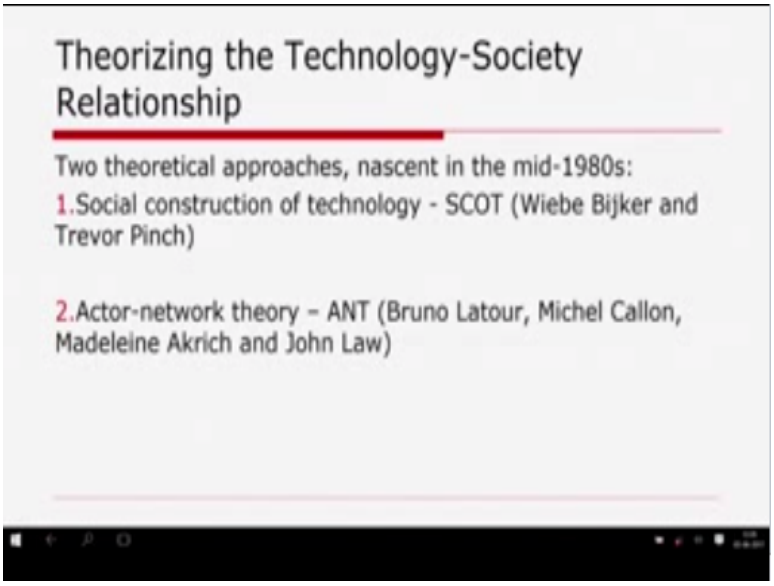

Through the theoretical approaches which we are quite nascent in the mid 1980s a particularly close varying often the social setting of technology, two what was, what where those two in the mid 1980s okay, there was first is the social construction of technology perspective developed by Wiebe Bijker and Trevor Pinch and represented here in a succeed extract from the work of pinch and his colleagues Ronald Clade it focus on the very few phenomena that has been under estimated in the debate over path dependence.

What is that part dependence in the context of social construction of technological systems is concerned that is the interpretative flexibility of technology then what is that interpretative flexibility I mean by current Pinch they discuss the construction of the bicycle okay, we can look at anything I mean we can look at refrigerator okay, we can look at television say, we can look at many, many we can look at a computer okay, we can look at power loop we can social construction of technological system.

I mean what is that interpretative flexibility interpretative flexibility the efforts to the way which different groups of people involved with the technology can have different understandings of that

technology including different understandings of its technical characteristics this is important. Suppose when you look at a particular dam project, particular project on dam where suppose Subashri dam in north east okay, I mean that particular dam elects its different response from different stack holders, okay.

It includes different understandings from different stack holders, different social groups, economic groups, political groups, cultural groups, pressure groups and so on okay, by current means focus is not just on the symbolic meaning of technologies okay, but includes also variation in criteria for judging whether a technology works or not, whether or not a technology works. The by current be social construction of technology approach I mean this sort approach draws heavily up on earlier work applying the sociological perspective to scientific knowledge.

Those developing the sociology of scientific knowledge such as debate Burno in 1976 sort symmetry of explanation we have already discussed blue I mean when we discussed the externalist characterization of the relationship between science technology and society earlier notion was that you know all knowledge except scientific knowledge is socially and culturally condition whereas Burno in 1976 pointed out that no it is not correct all knowledge including scientific knowledge is socially caused, okay.

Burno what did he argue I mean Burno argue that argued against the then prevent notion that true scientific knowledge was the results simply of unheeded human rationality and causal input from the material world instead of invoking social processes only when the creditability of false belief had to be explained Burno or give that proper explanation of all knowledge true or false, true and false both I mean typically you would involve recourse to material input psychological processes and social processes as well.

There are few more difficulties and more contents topics then what sociology of knowledge symmetry would be taken into and certainly not all subsequent authors employed the term in the way blue did. For by current Pinch in the context of sort asymmetry means avoiding explaining the success or failure of technologies by whether or not they want for them machines work because they have been accepted by relevant social groups okay.

How are those relevant social groups is also a matter of political choice, political selection okay. To our minds this formulation under plays the extent to which okay, for walk man and make

engine okay, such formulation whether they work or not for them I mean for by current Pinch machines work because they have been accepted by relevant social groups machines do not work because they have not been accepted or they have been rejected by relevant social groups to for make engine walk man such formulation under plays the extent to which technology always involves interaction between human beings and the material world.

But they whole heartily agree that historians and socialist of technology should consider the pack that this machines work as something to be explained rather than take it for rented in our explanations in their explanations. In particular explanations of successor and failure in terms of the intrinsic superiority or inferiority of technologies are suspect because of the path dependence of the history of technology that one type of machine works better than the alternatives may reflect the histories of adoption and improvement rather than any intrinsic unalterable features of the technologies involved.

The extract from claim and Pinch's article ends by sighting some of I mean we can go and on these it is I mean see it is important the first is the issue of structural exclusion and poor the relevance social groups or not is a matter of political choice, political selection as we discuss okay, I mean it is the issue of structural exclusion in this sort approach what we find that the social group s relevant from the point of view of a particular technology are typically identified empirically in historical research for example we can identify what social groups are relevant to it respect to a particular anti fact by note in all social groups mentioned in relation to that effect in historical documents suppose when power we must introduced when handlooms in flow when power introduced who were those relevant social groups who accepted that no power is recorded no more handloom okay that relevant social group matter of political choice okay.

I mean it is also historical conditions that trouble of course is that the exclusion of some social groups from the process of technological development okay making such that they have no empirical dissoluble influence on it and or not for example mentioned in documents concerning it this for instance will often be the case where women ethnic minorities and men or workers when I say men or handlooms or power looms there is handloom is done by men only right.

The power looms is done by women okay and those men who are not familiar with the who have not being made familiar with this sophisticated power looms there will be left out there will be socially politically economically explored in cultural exploded right in this case it would be the

most freeze assumed that gender is relevant to development of technology just because no women were directly involved and the masculinity of the men involved never mentioned explicitly in discussion of it.

And analogies points whole class and especially explicitly the point is a difficult one we would not claim to have formula for how to analyze the effects on technological development of structural but it leads always to be kept in mind the influence of politics often weapons technology is for example by no means always the direct one of technologists compliances with explicit political demands okay.

And then it can also take the indirect form of the effects technologists to keep that technologists as black boxes open to scruntise from the political system that developers of the US submarine relates to technology for instance carefully avoided design of sense that might lead to political controversy and congressional involvement however the other problem with the origin of the formulation of this Scott approach is one that also manifested itself in the first edition of that open handbook.

That is the reciprocal relationship between artifacts and social groups the theoretical perspective that has done most to sensitize the field this is what you often called the second theory theoretical approach that we witnessed I mean in the 1950 this actor network theory propounded by Bruno Latour Michel Callon Madeline Akrich and john law and so okay.

And a and it represent it I mean, I mean at the actor network clearly represented here by the extract from the work of latour and I mean what we are trying to do here that we looking at mostly latour for on actor network even callon's what Callon's work and so on the key point can be conveyed by you know let me prove it this way that in that 1985 fast edition of that reader handbook on science technology and society studies.

That it was taught that taught largely of the social setting of technology in terms of the influence of social relations of the acts the problem is with the formulation is its neglect of the avlid aspect of technological determinism the influence of the technology often so severely less to put it in other more accurate words that si mistaken to think of technology and society as separaetes fears influencingly eacxh other.

I mean technological society at mutually constitute the reason why from the varied and influenced writings of latour I mean wide we are trying to look at active network theory it is, it is an important I mean both Scott as well as ANT it important theoretical approaches to study the relationship between technology and society.

I mane what to I mean to sum up the theme quickly about scot and ANT that Scott approaches I main Scott focuses interpreting flexibility of technology which refers to the wage in different relevant social groups involving with technology can have very different understandings of that particular technology included in different understanding of its script technical character the critic to such Scott approach is the exclusion of some social groups from the process of technological development and the reciprocal relationship between the social groups okay I mean we have already discussed then what is this ANT active network theory I mean active network theory okay.

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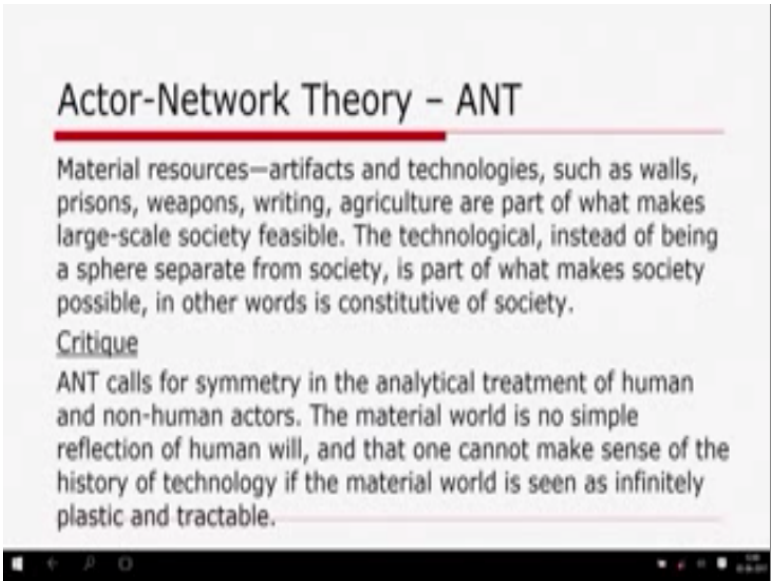

I mean it well upon material resources artifacts and technologies such as walls, prisons, weapons writing agriculture are all are part of what makes large scale society feasible the technological instead of being a sphere separate from society or social is part of what makes the society possible in other words is constitutive of society.

What is the critique to ANT calls for symmetry in the analytical treatment of human and non-human actors the material world is no simple reflection of human will and that one cannot make

sense of the history of the technology if the material world so seen as infinitely plastic and tractable okay.

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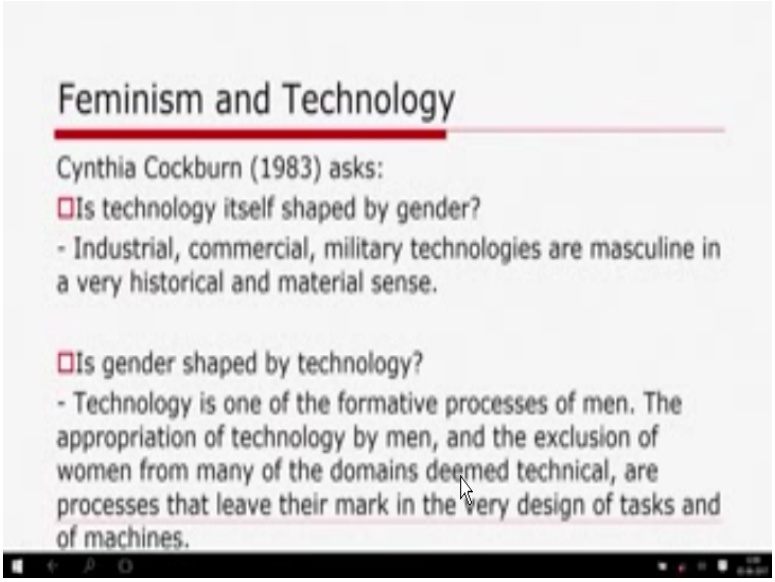

Coming to constructing gender constructing I mean we can look at many, many things that how do we construct gender and how does feminism examine technology how can or how technology is constructed through gender is set by gender okay will discuss this in the lectures to follow.

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