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THE STATE AND THE ARTIFACT

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Abstract

The social science analysis of the history of technological artifacts and investments was much developed in the last ten years. Social constructivists reformed the existing methods. Their approach is applied here to the famous case of constructing a barrage system on the Danube.

Keywords: social constructivism, history of technology, barrage system, science — technology — society studies, disclosure.

It is an article on the first phase of construction process of a barrage system on the Danube. This process shows at least three peculiarities. One of them is the overwhelming role of the state, a characteristic of the engineering work in the late socialism. Another peculiarity is the role of the awaking public opinion during the last phase of the story. As a third one could be mentioned that the technological artifact acquired a strong symbolic importance, even a changing one during its history. Nobody can seriously believe that the construction of any complex technological artifact is an issue of 'pure' engineering expertise but the Dam story is a rather unusual case, nevertheless. The fate of the barrage system became and continues to be a complex of political, ecological, economical and engineering issues. This complexity of the story makes it advantageous for cheking and developing some new approaches within technology studies, too. This is the perspective this article will take on the Danube-Dam case. There is a hope that a simultaneous effect can be achieved. The case can be enlightened if the method will be developed a bit further.

Changing Research Leading Ideas

STS–studies (Studies on Science, Technology and Society Relations, or to be shorter, science, technology and society studies) means an integrative,

social science approach aimed at exploring the complex unity of science and technology in society in which technological facts are to be seen as 'socially constructed' and not as results of the simple integration of outputs of autonomous scientific or engineering work and society outside. That is why STS type research is broader than, and different from the earlier sociology of technology that only focused on the institutional, organizational framework of the technological content.

It is rightful to look at the timely STS approaches as the result of a long attack on the earlier demarcationistic understanding prevailing in science research until the late seventies and in technology research perhaps until now. According to the demarcationistic ideas, sociology concentrated on the institutional, organizational structure and dynamics of science and technology development leaving scientific knowledge and technological artifacts and the scientific research and technological construction work, i.e. the content of the process out of account. A persuasion was earlier accepted as the research leading idea that scientific knowledge and technology as knowledge and skill have their autonomous way of development following the given laws of these developments, at least in principle and as a normative idea. Society provides the needed initial conditions and institutional, organisational form — according to this Mertonian type of understanding. These, the institutional and organisational forms were somehow accounted for as a bare vehicle for these autonomous processes.

The classical approach thus excluded curiosity about the effects of the social in the development of scientific or technological contents. But it did not exclude the reverse interest, which means looking for the impact of scientific knowledge and technological artifacts on society. The researchers, who got interested in the exploration of these impacts, concentrated on the effects of scientific knowledge and technological artifacts as if they were outcomes of autonomous processes, without analysing how society formed this knowledge and the artifacts in the research laboratories and designing departments. (And, of course, how society formed the attitudes in research labs and designing departments.) In other words, they reduced the mutual effect of society and science and technology on each other as if the feedback mechanism had not been more than the effect of science and technology on society plus the effect of society providing the institutional and organizational frame to an autonomous scientific and engineering work.

The criticism of this reductionism in technology studies came from three different corners. One of them grew out of an alliance of some knowledge sociologists and historians of technology [1.]. These researchers did not begin their work by the (recently valid) definition of the artifact under investigation but they concentrated on the 'interpretive flexibility' of technological artifacts. They went back to the historically worked out

'meanings' of the technological artifacts under investigation and looked for the 'relevant social groups' defining the artifacts from their perspective on them. They began to emphasize the process when 'the relevant social groups' 'negotiated' the available definitions, tried to reject the others' and get recognized their own. They followed these debates until they got their 'closure', this final step in the struggle for fixing the meaning and definition of the artifact under examination.

Dealing with history in this manner they left aside and overcame a special type of a historicity of the earlier approaches. These approaches formed their research topic by accepting a seemingly obvious precondition. Starting their exploration from an artifact, being successful today, they developed constructing a special view on history. According to this view success was its own explanation and did not need any social explanation. Final success was seen by them as an indicator of a natural characteristics and history of the artifact was to be seen as the process leading to the victory, which was in principle already inscribed into history from the very beginning. According to this understanding, that had a monopoly in research until now, history was somehow to be seen as if it had realized an inscribed plan (or what is the same an inscribed necessity). What needed explanation was the set of obstacles to the chosen (by the end of the story) successful item and the process of how these obstacles could be put aside throughout history. According to this look the final success was somehow preprinted into these items by the autonomous laws of scientific cognition or the engineering work and the investigation of the social 'side' was to be reduced to the explanation of how this inscribed success could be unrolled during the process when society learned and understood it in history. The relation of success to history and society was reduced to a learning process instead of a genuine action. And indeed, provided society had not changed its preconditioning of scientific and engineering work by changing value orientations, the historical social process of the consecutive series of actions in fact could have been reduced to a historical learning process much more. In contrast to the earlier methodology of exploring the obstacles to the finally successful item, realizing in this manner a sort of asymmetry, the new maxim became a sort of symmetry principle. According to this, success needed a social constructive explanation of just the same measure as failure. Concentrating now on technology, this maxim required to look for those social changes that favoured one solution to the others. As mentioned earlier, the old type explanation believed to 'enlighten' how history had to strive for the state of the affairs we are living in now. (Small wonder if anybody considers that the recent success of the scientific or technological issue to be investigated was taken out of the elements to be explained in advance.) The threat of the vicious circle was not seen because of the

previous postulation of a different, additional type of explanation of the successful, different from the historical. The vicious circle was avoided only by referring to the truth and, timeless, functionality, in other words to 'autonomous' laws of scientific cognition and engineering construction activity. But this behaviour could not prevent another circulation. Because the state of the art now as something non-historical was chosen to be the end of the historical explanation, the state of the art and the successful artifact itself was to be seen as a finished one. The explanation, according to the old maxim, has completed history by now, started from the present and having finished a photosafary of the past it arrived back to the same present. It did not lead to any statement of an open future based on historical deduction. To open this completeness was kept for the future in the reality, the historical explanation had nothing to do with it.

On the other hand, looking at success as completely historical and at any historical stage as included into human action the new maxim kept the way open to understand how the past not only produced the present as a state of affairs but also something full of alternatives, partly hidden behind the surface.

The social constructivistic approach to technology studies unified the criticism over the above mentioned 'modern mindedness' of the earlier writing of history with an 'inside the black box' approach to the topics of investigation. Following this way they tried to reconstruct how these, in the period of writing history successful artifacts got their 'natural' definition, which seemingly gave them their non-socially constructed character and their a-historicity. Important in this methodological approach has been, to put it differently, that it did not work with definitions taken from handbooks or anywhere but concentrated on the reverse process, how an artifact, through which type of social construction process got its fixed, accepted definition(s). They not only dynamised the understanding of the construction process of technological artifacts, but, simultaneously with this effort, looked at the walls 'between' society and technological artifacts as highly permeable ones. What will be the 'pure' technological in a later period has been strongly socially constructed in the same process in which it got the appearance of 'pure' technological. Technological artifacts got a deeply contingent character through this approach.

An important feature of this new research attitude is the criticism of the barriers and the distorting nature of the disciplinary perspectives on the dynamics of technological change. The claim is that disciplinary perspectives, e.g. an economic history, a political history of technological change, etc., do not only give a strongly reductionistic and one sided understanding of the explored issues but also distort them. A well-known American historian, T. P. Hughes shows examples of how the complexity

of the historical process can be better reproduced when the investigator looks for a 'seamless web' in which the technological changes occur [2.]. Everything flows together in this 'seamless web' joining technological, economic, psychic or political arguments in very peculiar structures by chance, providing the concretely needed bulk to overcome the barriers to technological innovation. His concept of 'reverse salients' helps to focus on the crucial barriers to technological innovations conceptualizing these barriers as complex social issues.

A third root of timely research on the dynamics of technological change came from some French researchers. Their 'actor — network' approach tries to avoid any difference between living and non-living actors of the story. (This is a step that has gone beyond my understanding several times, notwithstanding the usefulness of the approach)[3.].

The new type exploration of the introduction of technological artifacts into society has been advancing much in the last years. Recent researches demonstrated the efforts of maintaining the demarcations and fixations, how the accepted 'definition(s)' were preserved and maintained by complex social processes and built into the firm structure of society.

It is hardly surprising that even the new type technology studies, in some respect, concentrated on successful stories. (Dealing with them, of course, as genuine social processes.) It is not without reason why a historian is more inclined to explore the history of successful inventions than the history of failures. But a concentration on the successful technological projects can only be justified by pragmatic reasons [4.]. Theoretically there must be a symmetry in research and failure stories must have a place together with the success stories on the same level of research. They are equally important in history, provided we accept a full-hearted social constructivist perspective.

The story of the dam building is especially interesting for the 'social construction' type STS studies, because, instead of a success story, it has to deal with the reverse process. (Or the situation is even more complicated.) The reader will see how an initial 'closure' was set up. The whole process afterwards is the deconstruction of the initial closure, at least until 1989. New and new groups tried to develop and get through their definitions, according to their values differing from the initial ones, in an emerging and developing struggle for the redefinition of the technological artifact and 'the technological debate' ended in a final, or through a look at the newest development, actually a semi-final disclosure by 1989.

The research on failure stories is very rare until now [5.]. Thus, STS studies perspectives cannot only help understand the concrete case by providing some basic methodological guidelines, but, vice versa, the exploration of the case by these new STS research means can make the STS

arsenal richer by an initial understanding of the reverse processes of getting final disclosure.

In this sense, as mentioned earlier, the exploration of the case is important from a theoretical point of view for STS studies. On the other hand, the case is important enough to reveal the decision mechanisms of how large-scale technological investments were constructed and realized in a socialist system. Moreover it can help Western readers understand how two typical features of the political process, the so called overall planning and the autocratic state decision making, based on the highly totalitarian structure of the system, perhaps surprisingly enough, were connected together.

It has already been mentioned that the large-scale technological investment had its fixed definition when the state-treaty was undersigned in 1977. When the disclosure became stabilized by 1989, that means the project became officially seen as a fiasco and became officially set by stopping the building process at Nagymaros in Hungary, a changed definition of the artifact became accepted and institutionalized. This 'technological investment' case has got a very distinctive feature, it got deeply included into a possible systemic change of a whole societal-economic formation. Through this connection it got the definition of a 'political(technological) artifact'. What makes the story more interesting for theoretical reasons, this characteristic of the artifact was hidden behind an ecological definition. That means that it was a political expectation by the large masses that the new government accepted this ecological re-definition of the investment and identifying it as a threatening ecological monster stopped continuing its building process.

Life is sometimes surely richer then the wildest fantasy. As everybody knows, at least in East-Central Europe, the stopping decision by the Hungarian, late socialist government in 1989 was not the last word. By now, early 1992, the Czech — Slovakian partners are beginning to realize a modifying technological solution that allows them to utilize the rest of the dam — system, without the permission of Hungary.

By the time of finising this article, end of October 1992, there is every sign of the birth of the Danube monster, having got its final form through the last technological changes, by an additional canal finished in Czech-Slovakia just now. And some days after the diverting of the Danube by a dam in Czech-Slovakia there is now every sign of a beginning ecological catastrophe on the Hungarian territory. But this is surely not an article that has to pass sentence on the story. The writer does not deal with the evaluation of who is right and in what extent. The aftermath story is interesting here because it may show something for STS — studies bringing the researcher nearer to the nature of 'technological' controversies.

Constructing a Danube — Dam System in Late Socialism, the First Phase

A natural force of the magnitude of the Danube can be obviously used for different technological goals such as shipping, irrigation, energy production, entertainment, separation or connection of regions, diverting sewage. The Danube can be utilized very differently and only this allows us to guess a genuine place for social constructivistic interest. Having this wide range of possible objectives and the possible multifunctional utilisation, it is small wonder that building a dam to the Danube can be justified by different objectives according to time, actual power structure, etc.

As a matter of fact, people in different times looked very differently at the Danube as a technological possibility. While the problem of safe and unbroken shipping (the Danube creates a natural obstacle to shipping at the borderline between Hungary and Czech-Slovakia for more than 2o km) or irrigation became early concern already in the 19th century together with flood control. This is the time when the primitive land was changed into an artificial one, where agriculture and forestry also got its place. The idea of the utilizing the water for energy production came much later. Actually it was seriously considered for the first time after the second world war. This lateness is no wonder for the Danube runs on a plane between Hungary and Czech-Slovakia offering much less for energy production than in the mountains.

An immense energy hunger that was caused by the beginning of extensive industrialisation, the project of the socialist industrialisation, was in the background when Hungary and Czechoslovakia agreed in 1953 on building up a dam system. Beside the state interest in raising energy production the interests of the hydraulic engineering were much behind the project. Based on some new technological development, especially in the SU, but also in different Western countries a large scale utilisation of rivers of law gradient began. New technological achievements made the utilisation of this type rivers hopeful for energy production. Energy production and irrigation were the main objectives everywhere together with shipping. In the case of the Danube shipping did not play a role for the 'iron curtain' began at the frontier of these countries with Austria [6.]. Notwithstanding the tremendous financial and the political problems concerning the dam building on the Danube and the open problems of the harmonization of the different possible objectives of the Danube utilization the state decision was made favourable for the realization of a dam system, mainly for energy production, in the common effort of Hungary and Czechoslovakia. But the very serious economic crisis followed by a minor change in the political leadership in Hungary in the summer of 1953 stopped the further

construction work. We find a very reduced 'technological controversy' in this phase of the story. There was no social mechanism to form and accentuate the possible different relations to the possible artifact. Decisions based on the persuasion of political leaders, mainly reinforced by experts called by them to the 'arena', fixed the overall structure of the possible objectives and the whole depended very much on contingent elements to be involved into the discussion process. Special industrial and engineering interests which were adapted to the overall political intentions and the very intuitive technological picture of the social tasks in the heads of political leaders fixed the 'interpretation' of the possible artifact in a very reductive way. Once fixed, once it became official, the 'interpretation' of the artifact, in our case defining the dam system as aiming at energy production, was preserved by political power.

The idea was continuously worked on from 1958 in the 60s and 70s. One of the problems was that the project still gave a very high priority to energy production. But hydraulic engineers could not fully persuade even the energy experts. Producing energy by the Danube could not be appealing enough for financial (and perhaps for lobby) reasons, either. Until the 'energy crisis' in the early 70s water energy production was worse economic possibility than, among others, the brown coal and lignite power plants. (The comparison of the possible ecological damages was not a point of view.) There were two possible lines to raise the persuasive capacity of the idea of the dam system. We follow here the argumentation of the well known environment protectionist, Jnos Varga, when stating that to make the project of a Danube dam system more appealing the constructors constantly had to raise the amount of energy to be produced by the hydroelectric power station [7.]. In the early 50s the energy expected to be produced was about 140 MW. By the final plan of 1977, it was raised to 880 MW. Clearly, a lot of people and institutions, engineers and politicians looked at the dam system as an energetic investment, other interests were pushed into the background.

Some of these interests should be mentioned here. The agriculture clearly stood behind the industry in the preference list of politicians in any socialist country. Irrigation, underground water management was seen as less important than energy production. Another interest was of different nature. Any technological realization of the planned dam system, as mentioned already, was to be based on a previous political decision dealing with the problem that a shipping channel was either to be realized on the Czechoslovakian or on the Hungarian side bringing shipping practically to one of the mentioned countries. The realization of either of these technological possibilities was changing the status quo, fixed by international treaty, according to which shipping was to be realized between the two countries

along the river. The agreement in the early 50s preferred the realization of an artificial canal on the Czechoslovakian side for minor rentability reasons. It was a decision that could be made easily when the national interests were pushed behind the so called 'internationalism'. Hungary practically lost the possibility of the utilisation of the Danube more than 20 long without any credit-entry. The other line to follow for raising the persuasive capacity of the plan was to develop a multifunctional utilisation of the artifact, a possibility that was strongly neglected in the early 50s. With respect to the peculiarities of distribution money in a socialist state this widening of the project could have had different aims in the background. Serving different interests multifunctionality could help bringing the plan more appealing for political decision makers. A growing inclusion of different interests in comparison to the early 50s was one of the characteristic features of politics in Hungary of the 60s, and agriculture was reevaluated. But Jnos Varga may have got right, too, when a special lobby manipulation was guessed by him as follows. In case it could have been shown that the artifact had to realize a multifunctionality the costs became partly requested from budgets different from the energy sector. The costs became, in this meaning, relatively lower [8.]. From the viewpoint of STS studies it is important to state that the dam-building project got a reinterpretation toward multifunctionality from the 60s. A striking feature of the planning processes in the 50s is that there was an obvious indifference toward the byproduct of any industrialisation, toward sewage production. The Danube as sewage carrier was not in the forefront of the consideration list of the constructors and decision makers. The typical industrialisation ideology, with its very reduced goal system and enthusiasm for reconstructing nature into an industrial object, was behind the process. This exaggerated, one-sided industrialisation ideology caused a lot of harm in the leading industrial countries in the West, too. But, concerning the social and environmental effects, it seems rightful to state a decisive difference. This difference in the effects may be caused by the difference of the political systems. That means that a totalitarian socialist system could stop in advance any possible protest coming from the private sphere, from independent social actors. Nationalising the decision system, reducing it to the closed relation of state bureaucrates and the technical experts (acknowledged by the state bureaucracy as well), it 'freed' the decision mechanism from a very important feed-back warning system in consequence the effects of a blind industrialism could be fuller. The energy crisis of the 70s was that made a decisive push on the large scale investment to which financial means continuously failed. The inter-state contract of 1977 fixed a variant of the large scale technological investment with a maximized energy productive capacity. Multifunctionality was taken into account as serving energy production.

One can be curious about the details how the basic ideas of the social constructive approach can be applied to the dam case. This artifact is surely open to 'interpretations', for it can be developed for different goals. But the hydraulic energy lobby had a decisive role in the preparatory phase before and after the inter-state contract in 1977. There was no real 'controversy' among the different groups having different relation to the project interpreting the artifact differently. Nevertheless the hydraulic engineers had to persuade of the rentability of the construction process not only the energy experts but also some other branches, too, especially the agricultural experts and the navigation. Their interpretation of the artifact was not that much favourable as that of the hydraulic engineers'. But during the preparatory phase of the project, until 1977, the project slowly developed into a multifunctional one, into a project of a dam system constructed mainly for energy production, but at the same time, integrating, among other functions, the solution of secure shipping as well. The 1977 contract can be seen as the official 'closure'. The function(s) of the dam system project were fixed by the state and socialist countries had various political tools, including open violence to preserve the validity of the official 'interpretation'. This can be seen as the closure of the first part of the story, until the project became a state protected one in a fixed form.

The project was not developed against a fixed background, even not during the preparatory phase. As mentioned already, agriculture was re-evaluated in the 60s, international shipping got a new accent, especially in connection to the Rhein — Main channel, by the 70s, a new opportunity for development probably more understood by the Slovaks than by the Hungarians. Two more elements which flew into the later unified problem of environment protection also changed the background to the technological project. One of them was an 'objective' one, that was the rapid growing of the quantity of sewage that slowly begun to make an influence on the technological planners to widen the perspective. (The raise of industrial and communal sewage during ca. 30 years was of order.) The second one was a new ecological consciousness pushing much more emphasis on the preservation of natural environment, especially in comparison to the practically full neglection of this perspective in the earlier period of industrialisation ideology. The background, the system of the objectives to be considered for the technological construction work, begun to change. The agricultural interests in some measure, shipping were included into the extended construction work, much less the problem of sewage. But it seems not to be a mistake to state that the natural environment protection was fully neglected before 1977. It was together with the problem of diverting sewage and some other components that got included into the complex en-

vironmental problem that became one of the main points against the dam building by the 80s.

Three other components of the resistance in the 80s were 'preprinted' by the earlier decisions. We mentioned already that the technological decision had a component dealing with national interests when the decision fell for the favour of an artificial canal. The changing weight of national interests by the 80s brought with it at least a new accent in the evaluation of the technological construction. We also mentioned already that the 'technological controversy' was of a socialist type, highly omitting everything not included officially into the politician — expert ensemble set by the politicians. This is the point through which the dam project became one 'tensile text' of the socialist political system. The third point, the economic rentability of the project on national economy scale became also especially serious by the 80s.

From the viewpoint of constructivistic STS studies this preparatory phase of the dam project is interesting as the socialist state variant of setting, managing and closing technological controversies, seemingly leading to a closure and 'successful' construction of the artifact. With reference to our earlier statement about the explanation need of success it is to say that the energy crisis in the 70s together with the energy shock, a contingent element stabilized the decision on the construction, made one contingent possibility of the possible 'interpretations' of a Danube dam system the officially fixed one. Neither earlier nor much later was the situation favourable enough.

From a theoretical point of view this first phase of the story is of less interest then for the historian, it is just a variant of how successful artifacts may be developed. The reverse process is more important for theoretical reasons, for it is rather unexplored. This is when the realisation of a once fixed project will lead to its disintegration and realisation. The second phase of the construction process of the dam system is an outstanding example of this. For editorial reasons an another article tries to explore the mechanism of this disintegration.

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