ISSN: 2008-5079 / EISSN: 2538-2365
DOI: 10.22034/AAUD.2020.113256

A Critique of Engineering Discourse Intervention in Historical Kurit Dam, Tabas, Iran (Explanation of Engineering Discourse Approach to the Historical Building)*

Ahmad Aminpoor[a]- Saber Asadi[b]- Parisa sadat Bashtani[c]**

[a] Assistant Professor of Architecture, College of Architecture and Urban Design, Art University of Isfahan, Isfahan, Iran (Corresponding Author).

[b] Ph.D. of Conservation Building and Urban Context, Art University of Isfahan, Isfahan, Iran.

[c] M.A. of Architecture, Department of Architecture, School of Architecture and Urban Design Engineering, Shahid Rajaei Teacher Training University, Tehran, Iran.

Received 15 May 2018; Revised 18 October 2018; Accepted 21 November 2018; Available Online 21 September 2020

ABSTRACT

This research concerns how engineering discourse deals with the historical buildings. To clarify the subject, a case study has been analysed that was followed by a lot of discussions: A project to increase the exploitation of the Kurit River in Tabas[1]. The present research seeks a more accurate reading of how the engineering practice deals with historical buildings, though inquiring how engineering discourse reacted to this historical dam and what its reasons were. Such an approach have not been addressed in previous research, as neither conservation nor particularly engineering discourses have considered the decision-making process and its outcomes and failures. This main questions of the present study are whether these failures are caused by personal or organizational mistakes or can be tracked in dominant principals of the engineering method in dealing with the concept of conservation; and how such failures could be diminished by redefining some principals. The present study is carried out based on the historical discourse analysis by Ruth Wodak[2], and using case study, i.e. the engineering discourse interventions in the historical Kurit dam are analysed and discussed in details. This research aims to propose a model for the engineering discourse to deal with the historical structures, on the basis of recognizing the problem-solving process in this discourse and it also tries to modify this process by entering the concept of heritage value related to various aspects of a historical building, which is in the conservation discourse, in engineering discourse. Through such a regard, the decision-making process in the engineering discourse will be modified in a way that its outcomes can preserve the values and different aspects of authenticity of buildings.

Keywords: Engineering Discourse, Heritage Values, Construction Value, Interdisciplinary, Kurit Dam.

* This article is taken from the second author's doctoral dissertation entitled "Protection Requirements in the Application of Engineering Tools and Methods (Explaining the Interdisciplinary Approach)" with the guidance of Dr. Mehdi Hojjat and the first author in the Faculty of Conservation and Restoration, Isfahan University of Arts.

** E_mail: aminpoor@aui.ac.ir

1. INTRODUCTION

The Kurit dam, with more than 8 centuries old, is the oldest double-curvature arch dam in the world (Tanchev, 2014, p. 22; Hejazi & Mehdizadeh Seraj, 2014). This dam has been undergone some interventions, based on engineering discourse in a period between 2000 and 2005, as discussed in details below). These interventions led to the removal of some historical values of this dam, although they completely achieved its physical conservation. As a result, they promoted many criticisms by the historical building conservators and local societies, as well as lots of worries for the historical monuments lovers. Some examples of these worries can be seen in the monographs of specialists on their visit of this historical dam. Most of these visits were followed by regrets and worries and sometimes surprises of the inefficiency of the new concrete dam, and even the regret of damaging the oldest double-curvature arch dam in the world could be seen within the articles in the field of water resources (Tanchev, 2014, p. 22; Emami, 2014; Farsnews, 2011).

Is the mistake due to incorrect evaluations and decisions of the project consultant, or does it go back to the defects of mechanisms and instructions of engineering method, as well as its approach to the concept of conservation?

By investigating and formulating the path of choosing these interventions, this article tries to identify the deficiencies and structural failures of this path (dealing with historical monuments in general). The issue of Kurit dam can be regarded from the perspectives of various specialists; 1. The conservators for whom the Kurit dam and its conservation are focal points; 2. The engineers and specialists in the field of water resources who seek to harvest water from the Kurit River and its catchment area. Considering these two opposite perspectives, the final decision was to build a new concrete dam next to the historical dam, which resulted in the removal of its function as a dam.

The main criticism of the decision is that its authorities think that through this decision they have preserved the historical dam and kept it unchanged; while the most important value of this dam has been the continuity of its function for 800 years; a value that is even counted as a specific and unique characteristic of the historical buildings; Therefore, by interrupting this continuity, they have downgraded the dam into a mere structure.

Finding out why and how this decision was made and why this remarkable value was neglected will clarify the reasons behind worries or maybe the distrust of conservation discourses towards engineering, in addition to enhancing our knowledge of engineering course approach in other fields. Thus, this research aims to explain how engineering deals with historical buildings in general and specifically the Kurit dam and to present some solutions to eliminate its defects.

The present study is qualitative research carried out using the historical discourse analysis and case study. In historical discourse analysis that is based on Ruth Wodak's ideas the term "Discourse" refers to "the importance of an activity from a particular perspective". Through this method, while keeping the historical fabric, it is attempted to apply interdisciplinary problem-based approaches to explain how and why any discourse topic (engineering discourse, here) is born and will continue its life. Moreover, by surveying and analyzing the life cycle of the historical Kurit dam, from its construction date till now through the case study method, some concepts in the way engineering treats historical built structures, can be extracted. In this way, the engineering method and the resulted decisions will be examined and criticized regarding the philosophy of technology and engineering.

2. PROBLEM STATEMENT

Reviewing what discussed in the introduction part, the research questions are as follows:

• Would another solution be proposed if another group of engineers were in charge? If yes, why have the engineering discourse come to this solution?

• Was the reason for such mistakes only the negligence of conservators and the cultural heritage organization?

According to the questions above, the present study aims to investigate how engineering and conservation discourses have dealt with the historic Kurit dam in particular, and historical buildings in general, to decrease the undesirable conservative results.

To answer the abovementioned questions, the decision of the engineering discourse on the historic Kurit dam is investigated in terms of aims, method and examination process. In the documents of primary design presented by Aabpooy Conultant Engineers (Aabpooy Conultant Engineers, 1999), it was reported that the related authorities suggested to optimally use the old dam and control the flood and it was even suggested to increase the height of the old dam, but the consulting engineers have rejected both suggestions due to the following reasons and suggested to construct a new dam: the dam reservoir completely filled with sediment, the sealing and structural conditions are unknown, possibility of the destruction of the dam due to the water overflow, uncertainty of increasing the dam height (Aabpooy Consultant Engineers, 1999). Before analyzing the engineering steps in this project, the problem is defined from the perspective of conservation discourse.

3. CONSERVATION DISCOURSE

A holistic and accurate study of the subject, is the most important part of the conservation of historical structures. In fact, as conservation is a value-based theme, its main objective is to holistically and completely recognize heritage values and to conserve them for the next generations. Thus, to reach the best knowledge of a heritage subject, the conservation discourse method must be applied even though in the main project (the Kurit dam reconstruction project by Iran's Ministry of Energy), no trace of conservation studies can be seen.

3.1. Conservation Studies of the Kurit Dam

The history of dam construction in Iran, specially its northeast part, dates back to pre-Islam era. It was said that the Kurit dam was built by the Zoroastrians and the construction of Kebar dam[3](Tanchev, 2014, p. 697) dates back to the pre-Islam era. It was also said that the Kurit dam was renovated by Malik Qavurt[4] in the 11th century.

"After the departure of his brother (Alb Arsalan), Malik Qavurt tripped to Balochistan and Jiroft. He appointed an agent and Emir[5] and renovated the Tabas dam…" (Motedayen, 2011).

Various hydraulic structures in the eastern part of Iran, are the significant evidences for this history. Some of these structures are including Ternav bridge in Boshrouyeh City[6], Taghband Shahabbasi[7] dam, and Sarband dam. The Kurit dam is also of these most important structures.

The Kurit dam, with the coordinates of 33°26′11″ N and 57°14′31″ E, is located 53 km north of Tabas City and constructed in the narrowest point of a stone valley. Different aspects of this historical dam such as its location (Fig. 1), stone abutment, hydrological condition and the possibility of water collection in its drainage basin (Fig. 2), represents the hundred years of knowledge and experience in this region.

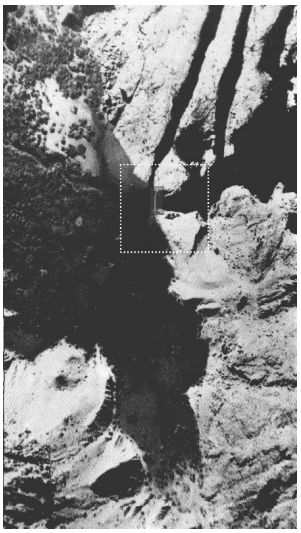


Fig. 1. The Location of the Historic Kurit Dam in the Aerial Photo Taken in 1956
(Daneshdoost, 1997)

Fig. 2. The Concrete Dam Constructed Next to the Kurit Dam and in the Area of the Related Lake
(google.com, 2018)

The dam has a double-curved shell structure made of stone and lime mortar (Sarooj[8]) . Its span is 52 meters at its crest and its wall thickness is 1.2 meters at the upper part and 16 meters at the lowest part of its bed. There is a tower in the middle of the dam and at its highest level, with the inner diameter of 60 centimetres and the outer diameter of 1.2 meters, which is actually the water retaining tower of the dam. The dam height is 60 meters, from the deepest part of its bed to the upper part of its crest (Sadeghpour, 1999).

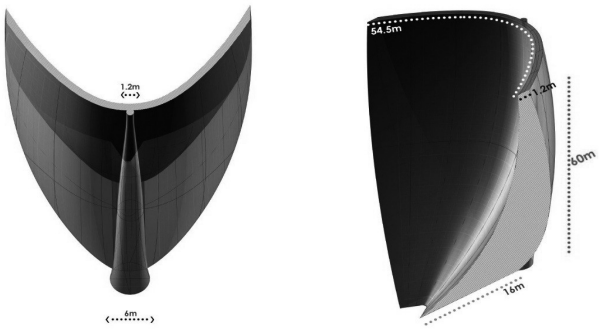
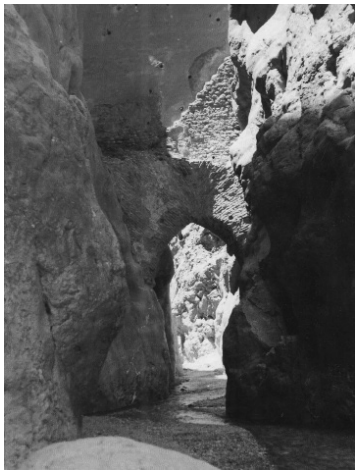


Fig. 3. The Dimensions of the Double-Curvature Kurit Dam

The construction method of the Kurit dam can be recognized by examining the structure of similar dams, particularly Taghband Shahabbasi. The construction process includes establishing a brick wall in the lowest point of the dam, and building the stone dam over it; by implementing such a method, the river path remained open during the construction process that may last several years; then it was blocked by materials like stone or mortar, in the last construction step. All these steps, except the final blockage of the dam, could also be seen in Taghband Shahabbasi (Figures4 and 5), which was left when being repaired, as quoted by

Monshibashi. In the structure of the Kurit dam, the application of various materials in forming the dam can be a sign of frequent repairs of it and the need to increase the dam height due to the deposit of sediments in its reservoir (Danshdoost, 1997).



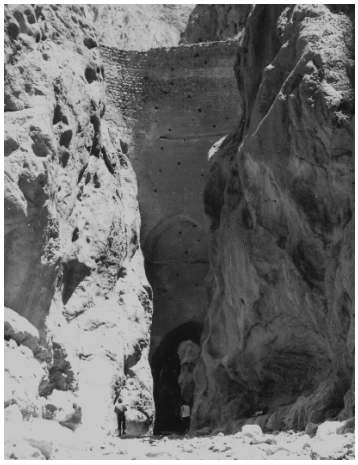


Fig. 4 & 5. Taghband Shahabbasi (Construction of a Brick Vault and a Stone Dam Over it)
(Daneshdoost, 1997)

In the 2000s, the fullness of the dam reservoir and the need to exploit the Kurit River more completely have raised the issue of how to deal with this historical dam. To solve such problems through ordinary engineering methods, solutions like destruction and replacement (Sardar dam in Tabas) or construction of a new concrete dam next to the historical dam (Kobar dam in Qom) have been proposed.

Fig. 6. The Concrete Dam Next to the Historic Kobar Dam
(https://mapio.net/pic/p-64824407/, 2017)

Fig. 7. Concrete Dam Next to the Historic Kurit Dam
(Tabas, 2012)

4. ENGINEERING DISCOURSE

To understand the process applied in the Kurit dam, first the definition of Engineering by itself must be examined; According to Encyclopedia Britannica, it is defined as follows:

"The creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behaviour under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property." (Smith, 2017).

From this definition, the following four important characteristics can be recognized for engineering:

(1) The innovative use of scientific principles to define and solve different problems.

(2) The use of technical knowledge (a mixture of different parts) to forecast the behaviour of different phenomena.

(3) A Judgments based on the values governing in engineering discourse (like the values of use, safety and economical advantage).

(4) The design of technical artefacts based on their definition in engineering.

These items can be defined in four categories of Method, Science, Value and Subject, based on philosophical studies of engineering approach.

4.1. Method in Engineering

Under this title, the engineering method is being discussed in the problems it poses. According to Billy Vaughn Koen, this method can be defined as follows:

"The engineering method is a strategy for causing the best change in a poorly understood situation within the available resources." (Koen, 2003, p. 7).

In this definition, the subject of engineering includes four main concepts: change, best solution, available resources, and uncertainty in the poorly understood

situation; these concepts act as a continuum and have a critical role in the formation of the engineering method to deal with different problems. With this assumption, at first place, engineering means to change or to transform from a status or situation to a new one, according to human needs. But change is a complex concept. Engineers make changes; but what matters is the consequence of these changes (Koen, 2003, p. 11). In fact, there are several directions to change the situation A to situation B, but what matters is to find the best direction that is named "best change" (the best answer) in this definition. The following sentence shows this characteristic:

"The best an engineer does is not the best; the best an engineer does is the best he can do." (Koen, 2003, p. 23).

Beside this, the best change is influenced by both the impossibility of fully identifying all the factors affecting the problem and the uncontrollability of factors known in the problem. This uncertainty is always attached to engineering and its inseparable dimension. Among other concepts influencing engineering method are the available resources. In fact, in order to make the best change from point A to B and to meet human needs, engineering acts based on the available resources and even the problem engineering presents is not separable from the available resources. Different resources imply different problems, and different problems require different solution techniques (Koen, 2003, p. 13); thus problems cannot be defined individually and apart from resources and these two affects each other. One of the main differences between scientists and engineers is this influence of available resources on the definition and solution of a problem.

Scientists seek to discover what already exists while engineers seek to establish a world from inexistence (Davami & Khodabakhshpirkalani, 2000, p. 37). If resources are known as one of the principals in defining engineering problems, then the influence of past experiences (as an available resource) will definitely be more evident on how different problems are defined. In other words, engineers often understand the problems based on the past experiences in the field of engineering discourse, and the changes they make under the name of engineering method to meet human needs, also stem from the past experiences.

4.2. Engineering Knowledge or Technical Knowledge

Generally speaking, engineering is an applied knowledge; in other words, scientists discover and organize scientific theories and tools while engineers apply them. Such a look has begun to fade among the specialists since the 1960s; for instance, Peter M. Simons[9] has named engineering as the science of artefacts, by differentiating between scientific and engineering knowledge. He believes that the ability of scientists in the field of natural sciences, is to understand and explain the reality; while the scientists in the field of artefacts (engineers) are responsible for changing the world in the favour of scientific purposes (Vermaas, Kroes, Poel, & Franssen, 2011, p. 123). The engineering knowledge can be characterized by being artefact-based, focused on usefulness (not reality) and having proficient aspect along with technologic rules (Ibid, p. 124); among which being focused on usefulness and not reality is the most effective. This characteristic shows that the mission of an engineer is to design and manufacture a useful artefact and this make an engineer different from a scientist who is searching for a knowledge about how natural elements work (Vincenti, 1993, p. 123). Another important aspect is the emphasis on technological rules. Actually, engineering knowledge generates technical rules and these rules are the necessary orders for performing a specific series or a mixture of actions to achieve a given purpose and an engineer is obligated to observed them.

4.3. Value in Engineering

There are various viewpoints about the relationship between value and technology (engineering); the neutrality of technology is one of the most important ones. The most famous instance for it, is this well-known sentence: "Guns don't kill people - people kill people". But this look has long not been so popular among technological specialists; it is mainly because the use value in technology is intrinsic (Poel, 2009). In fact, the values used in technology are somehow subtypes of the use value. These subtypes are: instrumental, economic, ethical, cultural and aesthetic values (Poel, 2009). All these values are derived from the intrinsic value of use and are a form of it. For example, the instrumental value is the same use value in its tangible form. The economic value is a form of a use of an artefact for compensating the construction cost and generating income, and finally, the ethical value emerges in reaction to consequences and changes made by technology. The intrinsic uncertainty in identifying consequences, locates the ethical value among the main and intrinsic values of technology. The most important ethical value in this field, is the provision of safety and confidence for engineering products. Judgment, based on the governing values, and the way the values could be discussed, is another point that shapes the engineering design steps. These values are involved in both steps of judgment and determination of the best solution. In other words, in the two last steps, firstly, engineering judges about what the main requirement is or more generally which requirement is realistic and which requirement is faked, based on the aforementioned values; and then, chooses a solution based on the same values.

4.4. Technical Artefact Design (Engineering Subject)

After reviewing the three principles of method, knowledge and value in the engineering discourse,

it's forth principle must be considered, which is the technical and design artefact. In the engineering discourse, the technical designer is responsible for proposing solutions; thus, before discussing it, technical artefact must be defined first: A technical artefact is an object designed by a person and has a specific function. Therefore, to deal with any technical artefact, the following questions must be asked: "What is it for?", "What is it made of?" and "How is it used?" These artefacts can be recognized through their differences from natural, artistic and social artefacts. Only the difference between technical and social artefacts will be discussed here. A technical artefact finds its specific function due to its physical characteristics; while the function of a social artefact is related to its social acceptance (Vermaas, Kroes, Poel, & Franssen, 2011, p. 39). Historical buildings can, more than anything else, be categorized as social artefacts; because the meaning and concept of a historical building and its worthiness and value are defined by the society it belongs to and in the next place, its physical characteristics are concerned.

Based on this description, technical artefacts are defined in two aspects; 1. Structural aspect: to describe an artefact with its physical, chemical and geometrical characteristics; 2. Functional aspect: to describe an artefact with the characteristics expected from it. Thus, the description of a technical artefact is based on its three aspects of nature including physics, function and application plan. Based on these three aspects, the technical design, as the fourth factor considered in engineering discourse, can be defined as:

"Technical design is an act in which to satisfy the complementary function (F.), a description (Ds.) of an artefact will be provided and the artefact has the physical structure (S.) And can effectively and efficiently satisfy the function (F.)". (Ibid, p. 55).

Accordingly, the different steps of technical design can be listed as:

• First step: Defining the objective, in which the designer defines the purpose of using the artefact.

• Second step: Providing a list of functional characteristics for what should be designed.

• Third step: Defining a structure for the artefact to reach the objective

• Fourth step: Describing the structure (Ds) in a way that it can satisfy the function (F.) (Ibid, p. 65).

4.5. Problem Solving in Engineering

If the conservation discourse is considered value-based, the engineering will be a problem-based issue. The usual way to deal with different problems in engineering is to follow these steps:

(1) Defining the main problem,

(2) Evaluating the subject using the methods common in the field of engineering, considering the objectives,

(3) Making a judgement based on the presented values in engineering discourse and adapting it with the problem &

(4) Proposing solutions according to the existing objectives and conditions.

5. READING OF HOW THE ENGINEERING DISCOURSE DEAL WITH THE HISTORIC KURIT DAM

In the case of Kurit dam, the steps can be redefined as follows, according to the problem-solving pattern in engineering:

(1) Problem definition: The problem here was to examine the possibility of more exploitation of the Kurit River and prevention of its water floods, through the utilization of the old dam or other options like increasing the dam height or building a new dam.

(2) Evaluation of the problem: In evaluating the problem by engineering discourse, the Kurit dam was investigated in terms of its adaptation with the objectives and the factors of the problem, i.e. the maximum exploitation of the river and water flood discharges.

(3) Judgement: In this step, regarding the problem, the presented objectives and the result of evaluation, a judgement has been made on the adequacy of each possible solution according to the values discussed in the field of engineering.

(4) Proposing a solution: Similar to Kobar dam, in this project, the construction of a concrete gravity dam next to the old dam was proposed although in the case of Kurit dam, the new dam was constructed with a distance from the old one and its first-grade limits because the values of the historical dam were more known. The dam crest is 351 meters length, and 60 meters height.

5.1. Application of Engineering Discourse Method in Dealing with the Historic Kurit Dam

The events must be reviewed from the date when the authorities decided to evaluate this historic dam considering its ability to meet local people's needs. At first, the question was whether it was possible to use the old dam to exploite current water resources and prevent the water floods of the Kurit river or not. The answer was negative according to the preliminary evaluations. Engineering was seeking to make the best change in the Kurit dam and river to answer this human need. In this direction, there were a lot of ways to better exploit the Kurit River, at least three of which were including 1. To conserve and renovate the old dam and to limit the local people's needs to what they have had for the last 800 years; 2. To conserve the old dam and increase its height to enhance the ability to exploit the river; and 3. To construct a new dam near the historical one to enhance the ability to exploit the river. Thus, the engineering discourse was about to make a choice at least among these three options. This choice must have been made on the basis of available resources and previous engineering experiences. But because of the

lack of experience in the field of the renovation of a historical dam and a reliable analysis of what Kobar and Sardar dams had gone through, there was not a chance for the first option from the perspective of engineering discourse; though if it is regarded out of the engineering domain, the most important available resource is the dam itself and all the evident and hidden information linked to the dam bed. If the intrinsic uncertainty of the engineering is not considered, such an important information resource will easily be forgotten. The first and second options did not have a chance to compete, as they were unknown for the engineering discourse.

5.2. Application of Engineering Discourse Knowledge in Dealing with the Historic Kurit Dam

In evaluating different choices and various change possibilities, engineering follows the aforementioned principles in engineering discourse knowledge. Among the characteristics of engineering knowledge, the most dominant one, i.e. being artefact-based, and the most important resource, i.e. the historical dam itself, have weak possibilities. In fact, engineering does consider the dam as a socio-technical artefact with 800 years old; but sees it as a pure technical artefact whose probability of utilization or demolition must be investigated. In other words, the antiquity is not a value in the engineering discourse. In this viewpoint, 800-years life and function of the dam are not remarkable, and the measurement criterion consists of different possibilities derived from the dam. It is the same for the technical design as well. In this case, the objective is to investigate the functional possibility of a dam (any dam), but not the historic Kurit dam! On the other hand, the knowledge used in the evaluation of the dam, is fully influenced by the technical rules. These rules, which are resulted from the evolutionary progress of technical knowledge, define the necessary orders for taking a series of actions that make the realization of the objectives possible. In the case of the Kurit dam, there are no standards for the historical dams or any similar structures. Thus, following the technical rules was inevitable for the engineering discourse in the case of new dams and the feasibility of their construction, leading to the removal of the first and second options. Actually, if in the two steps of method and problem definition, the engineering discourse could imagine a possibility for the options regarding the removal of the historical dam, then the lack of supportive technological rules would have omitted it. There is no instruction for knowing the historical dam and redesigning it according to its new function, and previous experiences also show such a lack.

5.3. The Values Governing in the Judgment of the Kurit Dam

It was already shown that in the evaluation of artefacts as well as the judgment and design process, the engineering uses the values that have all stemmed from the use value. Also in the case of the Kurit dam, this value is the most important judgment criterion. The use value refers to the ability of an artefact to meet more human needs, which here is the better exploitation of the Kurit River. Its subtypes are economic, ethical and aesthetic values. Economic value means the return of investment through the better exploitation of the Kurit River and the cultivation of greater area of lands[10]. Ethical values are also manifested in the safer exploitation of the river and the removal of damage possibilities, and only in the aesthetic value, the historical dam becomes important. This is the only aspect that can organize the main plan, so that the authorities, among which is the Cultural Heritage, Tourism and Handicrafts Organization, are more encouraged to intervene in the historical buildings to preserve them and reduce the cultural consequences of the plan. These presented values are reflected in the orders presented for the conservation of the historical dam (Aabpooy, 1999), but have always remained as subsidiary values. The principle is the maximum exploitation of the river and its basin. Based on these mentioned values, the first and second options have no chance in the engineering discourse and it is the construction of the new dam that makes the use value accessible. As mentioned, the aesthetic value was also among the instructions of the main plan, i.e. the construction of a new dam, to preserve the old one.

5.4. Technical Artefact Design

In the engineering discourse, the main subject is the Technical artefact design (here, the Kurit dam is the existing artefact and the concrete dam is the new one). Each technical artefact has three aspects: physical nature, use plan and function, and design means to describe the structural characteristics of the artefact in a way that it can satisfy the function. To solve a problem, in the design process, the decision is made based on the capabilities that the artefact must contain, which are safety and stability (in terms of engineering), being designable (in terms of material and construction technique) and having adequate knowledge of design; In this case, the decision is to build a new concrete dam, with the height of 60 meters and the length of 315 meters. Options regarding the conservation of the dam are not appropriate neither in terms of the aspects of stability and safety, nor the usual knowledge of practical design with the existing artefact material (stone, brick and sarooj mortar). Therefore, the main option will still be the construction of a concrete gravity dam, but to satisfy those who are worried about the historical dam, its conservation can be considered as one of the objectives of the new dam construction, based on the main aesthetic values of engineering discourse, using justifications like “protecting the old dam from the water floods that can destroy it” or “exposing the façade of the historical dam”. However, the main values of the

dam, i.e. its construction technique and its durability for over 800 years, will be destroyed by this action and this is a sort of demolition itself. Moreover, some evident points, like the damage of the historical dam due to its sensitive masonry materials by the vibrations caused by explosions, are neglected.

6. FINDINGS

The process gone through in dealing with the historic Kurit dam, from the first step (definition of objectives) to the presentation of solutions, has stemmed from the theoretical foundations of engineering discourse and the usual methods applied in it, and we know that this project aimed to enhance the potential of exploiting the Kurit river and to provide new job opportunities. Although there are some criticisms of dam construction, for example, the fact that the reserved water in the reservoir of the new dam has not yet reached to 20% of its capacity (7 billion cubic meters) since its construction and this shows the incorrect estimation , by looking at the process taken by the engineering discourse with the following objectives: to conserved the historic Kurit dam for future generations and to preserve its cultural, historical, social and technological values, some contradictions can be seen in each four parts of method, knowledge, value and artefact, that have led to the removal of some historical parts of the Kurit dam and its values.

6.1. A Criticism of the Engineering Method

According to what said about method, making the best change to meet the human needs, is the main purpose of engineering method and is done by using the available resources and being aware of its uncertainty. But when the objective is to conserve the dam for the future, the best consolidation is required instead of the best change. In other words, we have to meet the human needs by keeping what we've already had rather than making a change. With such a perspective, it is possible to evaluate the options regarding the conservation of the old dam, by meeting the needs of 800 years ago and to recognize the only available resource, i.e. the historical dam. In this way, there is no chance for the option of the construction of a new dam and even the second option will be considered doubtly.

This means that the concept of conservation is present in all parts of the process of dealing with the problem from the beginning. This goal can be achieved through the implementation of interdisciplinary orders.

6.2. A Criticism of the Engineering Knowledge

Regarding the main objective, which is the conservation of the dam, a scientific but not technologic knowledge is also needed in this field; a knowledge that is seeking the truth and wants to know all that exists, not a knowledge that is limited by technological rules and seeks the usefulness. Thus, engineering must attempt to reach a holistic knowledge of the dam construction technique by using the tools it had owned like different tests and analytical techniques.

6.3. The Value of Construction Technique (A Criticism of Value in Engineering)

In discussing and judging the values, in addition to instrumental, economic, ethical and aesthetical values, a vast variety of cultural, historical, social and technological values can be recognized and applied by the experts in the analysis and design processes. With involving such values, options like the construction of a new dam, that will almost fade all the values of the historical dam, are omitted. One of these values is the value of construction technique that must be taken from the process through which the dam construction technology is recognized. This value, with the engineering knowledge, is recognizable in the judgment step and that's why the engineering discourse itself, will refuse the construction of a new dam and the consequent removal of its most important value; because the engineering itself will protect it and not remove it, by recognizing the construction technique value.

6.4. A Criticism of Design

If correct estimations of local people's needs and the amount of water that can be reserved from the Kurit River are available, then all the expected potentials will be moderated according to the capability of the old dam. In fact, the human needs will be adjusted in this step considering what they were 800 years ago, and the grandiloquence that may harm the conservation of the dam and its sublime ambitions are avoided; and the false needs, like 7 billion cubic meters of reserved water and 3000 hectares of lands under cultivation anymore, which have not been possible during past 800 years due to climatic restrictions and not the lack of technology, and were also refused by spatial planning studies, will not be considered. As a result, the right solution must satisfy reasonable objectives, not the ambitious ones without historical background.

7. CONCLUSION

According to the findings of the research, which mostly addressed the causes of conflict between the objective of conservation and engineering discourse, a new framework is proposed to deal with historical monuments so that by applying it, the national management organizations[11] make efforts to conserve national heritage with global values, which are the product of human genius, while meeting the needs of local communities. The proposed model is the result of combining engineering discourse steps with conservation goals and steps.

According to the findings, a balanced engineering approach to a monument is to meet the needs of local communities while preserving the historical heritage of those communities. None of these two can be removed

or reduced in favour of one another. In other words, meeting local communities' needs is rational and significant until the values of historical heritage are not disrupted. So, it is necessary to take account, recognize and applied these values by the engineering discourse. The framework for dealing with historical structures consists of:

(1) Problem definition
(2) Conservation studies (historical and in-site studies)
(3) Problem evaluation
(4) Judgment (based on the results of the second and third steps)
(5) Proposing solution

Accordingly, different steps of dealing with the historic Kurit dam must be as follows:

(1) Problem definition: The problem here is the conservation of the Kurit dam while exploiting the Kurit River in proportion to its known capacity.

(2) Conservation studies: The Kurit dam, its 800-year function, and the periodic behaviours of the Kurit River are investigated by using the most important evidence, i.e. the historical dam itself and the trace of what it has gone through.

(3) Problem evaluation: In this step, the periodical changes of the river are defined, its water reservation capacity under the minimum and maximum rainfall is predicted, and adapted with the current capacity of the historic dam and local water needs.

(4) Judgment: In this step, the values identifies in the second step (including the construction technique) are considered the bases for evaluation and judgment and according to them, it is decided which values are a priority to be reconsidered or conserved and how much is the weight of each item of the third step in the final conclusion.

(5) Proposing solution: In this step, with the knowledge of the structure and its values, the final artefact design will be done by applying the maximum potential of the technological knowledge, and in accordance with the design objectives (conservation of the historical dam and satisfying the local water needs).

The authors finish this research with the hope of the better conservation of the Kurit dam and making new decisions for returning its values, as well as
the more accurate conservation of other historical structures by applying the maximum engineering power.

END NOTE

1. Tabas, formerly Golshan, is a city in and capital of Tabas County, South Khorasan Province, Iran.
2. Ruth Wodak (born 12 July 1950 in London) is an Austrian linguist, who is Emeritus Distinguished Professor and Chair in Discourse Studies at Department of Linguistics and English Language at Lancaster University and Professor in Linguistics at the University of Vienna. Her research is mainly located in discourse studies and in critical discourse analysis.
3. The Kebar Dam is a masonry arch dam on the Kebar River, Iran, located near a town of the same name, [1] 23 km southeast of Qom.
4. Kara Arslan Ahmad Qavurt (died 1073), better simply known as Qavurt (also spelled Kavurt) was a Seljuq prince. Upon his father's death, he led an unsuccessful rebellion against his relatives in an attempt to gain the Seljuk throne.
5. An emir, sometimes transliterated amir, amier, or ameer, is an aristocratic or noble and military title of high office used in a variety of places. It means "commander", "general", or "High King".
6. Ternav or Ab-bar bridges are located in the center of Boshrouyeh City, South Khorasan Province, Iran.
7. In 30 km east of Tabas, there is a 25-meter tall dam that is called the Abbasid vault (TaghAbbasi) by local people. This dam is near 450 years old. Iranians used to build dams over brick walls in narrow valleys and this innovative method has been used in this dam and it has protected Tabas from sever water floods for centuries.
8. Sarooj is a traditional water-resistant mortar used in Iranian architecture, for the construction of bridges, and ice pits or earth refrigerators (yakhchal).
9. Peter M. Simons (born 23 March 1950), is a British philosopher and a retired professor of philosophy at Trinity College, Dublin.
10. Cultivating 3000 hectares of lands near the dam, is considered as the objective of constructing a new dam. It should be mentioned that the Kurit village land reform program was abandoned because of the draught.
11. Ministry of Cultural Heritage, Handicrafts and Tourism, Ministry of Energy, etc.

REFERENCES

- Aabpooy Consultant Engineers. (1999). Studies of the Second Phase of Kurit Dam in Tabas, (Unpublished), Mashhad, Iran.
- Danshdoost, Y. (1999). Tabas, the City it was (Buildings of Tabas). Publication of Cultural Heritage Organization, Tehran, Iran.
- Davami, P., & Khodabakshpirkalani, M. (2000). What Engineering is and who Engineers are, Educational Editorial of Engineering, 35-55, Iran.
- Emami, K. (2014). The Historic Kurit Dam: an Illustrative Example of Water Wisdom. Irrig. and Drain, 63(2), 246-253. doi:10.1002/ird.1848
- Hejazi, M., & Mehdizadeh Saradj, F. (2014). Persian Architectural Heritage: Architecture, Structure and Conservation. LONDON : WIT Press.
- Koen, B.V. (2003). Discussion of the Method: Conducting the Engineer's Approach to Problem Solving. Oxford: Oxford University Press.
- Motedayen, M. (2011). The History of Kerman, Goli Publication, Kerman, Iran
- Poel, I.V. (2009). Design for Values in Engineering. In P. T. Dov M. Gabbay, Philosophy of Technology and Engineering Sciences (973–1006). London: Elsevier.
- Sadeghpour, A. (2014). A Study Over Characteristics and Damages of the Historical Kurit Dam in Tabas. National Congress of Civil Engineering in Tehran, Iran
- Smith, R.J. (2017). Engineering. Retrieved March 2018, 09, from Encyclopædia Britannica: https://www.britannica.com/technology/engineering
- Tabas, E.O. (2012, 10 23). http://www.tabasenc.ir/. Retrieved from http://www.tabasenc.ir/%d8%b3%d8%af-%d8%aa%d8%a7%d8%b1%db%8c%d8%ae%db%8c-%da%a9%d8%b1%db%8c%d8%aa-korit-dam/
- Tanchev, L. (2014). Dams and Appurtenant Hydraulic Structures, 2nd Edition. London : CRC Press.
- Vermaas, P., Kroes, P., Poel, I.V.D., & Franssen, M. (2011). A Philosophy of Technology: From Technical Artefacts to Sociotechnical Systems. London: Morgan & Claypool Publishers. https://ieeexplore.ieee.org/document/6812712
- Vincenti, W.G. (1993). What Engineers Know and How They Know It: Analytical Studies from Aeronautical History (Johns Hopkins Studies in the History of Technology). Johns Hopkins University Press.
- https://mapio.net/pic/p-64824407/. (2017). Retrieved from https://mapio.net.
- (1390, 05 11). Retrieved from http://www.farsnews.com: http://www.farsnews.com/newstext.php?nn=13901115000287.

HOW TO CITE THIS ARTICLE

Aminpoor, A., Asadi, S., & Bashtanic, P.S. (2020). A Critique of Engineering Discourse Intervention in Historical Kurit Dam, Tabas, Iran (Explanation of Engineering Discourse Approach to the Historical Building). *Armanshahr Architecture & Urban Development Journal*. 13(31), 17-26.

DOI: 10.22034/AAUD.2020.113256
URL: http://www.armanshahrjournal.com/article_113256.html