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Evaluating the efficiency of dam construction management and ways to improve it

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ABSTRACT: The main purpose of this study is to investigate the effect of environmental transformational leadership. Due to the dry climate, Iran always needs to plan for water facilities. Among the water facilities, the dam is the most important because of the supply of drinking water, agriculture, hydroelectric energy, etc. The construction of a dam has always been important due to the huge cost involved, and on the other hand, due to the complexities involved in its construction, it is accompanied by risks. In this research, the ways of increasing productivity in construction management and dam construction have been discussed by considering the issue of project control in order to save costs and time and increase the quality of construction.

KEYWORDS: construction management; dam construction; productivity

1. Introduction

From a long time ago, in the ancient history of this border and landscape, water and its extraction have always played a key role, and the ancestors of this land needed to obtain water and increase it with continuous and forward-looking efforts and with the amazing construction of water engineering infrastructure according to the conditions of their era. They have paid attention to the extraction of this precious substance. The vast land of Iran, with an area of 1,648,195 square kilometers, is one of the vast plateaus of Asia, in which about 13% of its area has a cold and mountainous climate, 14% has a temperate climate, and about 73% of the country has a dry and semi-arid climate. The main source of the country's water resources is the annual precipitation, and only a small part of the water resources is imported from neighboring countries. The average annual rainfall of the country is about 250 mm, which is less than the average rainfall of Asia (732 mm) and less than about a third of the global average (831 mm), although the range of rainfall due to climatic diversity and topographical and geographical conditions is from a maximum of 2000 mm in the northern coasts to 50 mm in the central desert, and 52% of annual rain and snow occurs in only 25% of the country's surface. In addition to improper spatial distribution, there is also improper temporal distribution of rainfall, so that about 90% of rainfall occurs in cold and wet seasons and the remaining 10% in hot and dry seasons. Thirty percent of the precipitation in the country falls in the form of snow and the rest in the form of rain, and considering the size of the country, the annual volume of atmospheric precipitation is 427 billion cubic meters, and the total amount of renewable water annually is about 130 billion cubic meters, which is equivalent to 30.5% of atmospheric precipitation. The increasing development of water facilities in order to extract as many water resources as possible, produce energy, control floods, deal with drought, protect water resources, etc. has been one of the most important goals of the government in realizing the development plan. Considering the very

important role of such facilities in the development of the country, the need to maintain their performance, achieve predetermined goals, the possibility of sustainable exploitation of water facilities, and the need to return large investments made in this industry, scientific management and methodicalization of the issue of exploitation. The maintenance and safety control of water facilities is of particular importance. Today, the water of this life-giving resource is considered one of the three factors of the formation and survival of the environment (soil, air, and water) more than ever before. Undoubtedly, nowadays, the preservation and protection of water resources and the optimal, economical, and fair use of water is a global issue, and for this reason, water is referred to as an all-encompassing human challenge. The emphasis of the world community is that governments and nations look at water as the key to development.

Completion on time and with the expected cost of any project is one of the main criteria of its success. Failure to complete the plan or project on time and with the expected cost will cause the employer's demands and project goals to not be met. This issue is more important in national and large projects such as dam construction, whose implementation period is usually long and their implementation takes more than six years on average. Dam construction projects, due to their importance in terms of exploitation and the huge amount of investment in them, as well as in terms of the nature of their complexity and the existence of many uncertainties in them, including underground conditions, facing disasters natural, and their high construction cost, are of particular importance in finishing on time and with the prescribed cost. Therefore, investigating, identifying, and evaluating the reasons for the increase in time and cost and providing solutions to solve them will bring significant benefits for the country's economy.

2. The necessity of doing research

Iran has a dry climate, where the main source of water is atmospheric precipitation, which is less than 1.3 of the world average. After clarifying the importance of the need for water, the search for the best way to supply or transfer it is considered. Dam construction has been identified as one of the possible solutions, and dam construction projects are one of the most important and largest projects in the country. Most large projects are implemented in dynamic and complex environments in such a way that uncertainty and risk are among their inherent characteristics. This uncertainty has made most of the country's projects not achieve significant success in reaching the predetermined goals. This issue leads to problems such as the lack of economic justification for the exploitation of projects, the reduction of efficiency, and the emergence of dissatisfaction among the key stakeholders of the project. Therefore, due to the lack of a clear strategy and systematic rules for greater management efficiency in the construction of water facilities, in this research, while recognizing the deficiencies and systematic problems, we tried to eliminate the existing gaps and reach certain principles for efficiency in system management, and hopefully we will be more efficient in this field.

3. Research background

Taghipour et al.[1] studied "Risk analysis in the management of urban construction projects from the perspective of the employer and the contractor".

Mahboobi et al.[2] discussed "Assessing ergonomic risk factors using combined data envelopment analysis and conventional methods for an auto parts manufacturer", occupational injuries are currently a major contributor to job loss around the world.

Taghipour et al.[3] studied "The impact of ICT on knowledge sharing obstacles in knowledge management process (including case-study)".

Khalilpour et al.[4] studied "The impact of accountant's ethical approaches on the disclosure quality of corporate social responsibility information an Islamic perspective in Iran".

Mirzaie et al.[5] studied "The relationship between social bearing capacities with conflict as a result, in the perception of the visiting historical sites".

Alamdar Khoolaki et al.[6] studied "Effect of integrated marketing communication on brand value with the role of agency's reputation (including case study)".

Taghipouret et al.[7] studied "A survey of BPL technology and feasibility of its application in Iran (Gilan Province)".

Seddigh Marvasti et al.[8] studied "Assessing the effect of the FRP system on compressive and shear bending strength of concrete elements".

Jalili et al.[9] studied "Comparative study of Khaje Rashid al-Din views on Rab-e Rashidi Islamic Utopia and Kevin Lynch ideas".

Taghipour et al.[10] studied "Insurance performance evaluation using BSC-AHP combined technique".

Rezvani et al.[11] discussed "The design of high-rise building with ecological approach in Iran (Alborz Province)".

Taghipour et al.[12] studied "The identification and prioritization of effective indices on optimal implementation of customer relationship management using TOPSIS, AHP methods".

Taghipour and Yazdi[13] studied "Seismic analysis (non-linear static analysis (pushover) and nonlinear dynamic) on Cable-Stayed Bridge".

Taghipour et al.[14] studied "Investigating the relationship between competitive strategies and corporates performance (case study: Parsian Banks of Tehran)".

Taghipour and Moosavi[15] studied "A look at gas turbine vibration condition monitoring in region 3 of gas transmission operation".

Rahmani et al.[16] studied "Providing health, safety and environmental management (HSE) program in metal mining industry (including case study)".

Taghipour and Vaezi[17] studied "Safe power outlet".

Azarian and Taghipour[18] studied "The impact of implementing inclusive quality management on organizational trust (case study: Education)".

Mohammadi et al.[19] studied "Investigating the role and impact of using ICT tools on evaluating the performance of service organizations".

Abdi Hevelayi et al.[20] studied "Predicting entrepreneurial marketing through strategic planning (including case study)".

Khorasani and Taghipour[21] studied "The location of industrial complex using combined model of fuzzy multiple criteria decision making (including case study)".

Taghipour et al.[22] studied "Risk assessment and analysis of the state DAM construction projects using FMEA technique".

Hoseinpour et al.[23] studied "The problem solving of bi-objective hybrid production with the possibility of production outsourcing through Imperialist Algorithm, NSGA-II, GAPSO Hybrid Algorithms".

Taghipour and Ahmadi Sarchoghaei[24] studied "Evaluation of tourist attractions in Borujerd County with emphasis on development of new markets by using Topsis Model".

Safdarpour et al.[25] studied "The effect of government support on innovation ability (including a case study)".

Ganjali et al.[26] studied "Strategic analysis of household hazardous waste reduction".

Taghipour et al.[27] studied "The impact of managerial factors on increasing the productivity of low-level employees (including case study)".

Ganjali et al.[28] studied "Investigating the relationship between environmental awareness and the level of education and occupation of people".

Baghipour Saramiet et al.[29] studied "Modeling of nurses' shift work schedules according to ergonomics: a case study in Imam Sajjad (As) Hospital of Ramsar".

Taghipour et al.[30] studied "The impact of motives from obtaining ISO 9001 certification on organization performance (including case study)".

Akbarnezhadbaei et al.[31] studied "Modeling the application of knowledge management system in order to improve the technology governance in the automotive industry of Iran using the data mining environment".

Akbarnezhadbaei et al.[32] studied "Determining a model for evaluating the knowledge management system in order to improve industries with the focus on educational technology and applying data mining concepts".

Molavi and Taghipour[33] studied "A survey on electrical cars advantages".

Safdarpour et al.[34] studied "The effect of communication on learning ability (including a case study)".

4. Research objectives

Due to the dry climate, Iran requires the use of water and drainage facilities, and on the other hand, some dams and irrigation and drainage networks are unprofitable due to a lack of proper construction or non-compliance with operating rules. According to these propositions, there has not been a systematic and comprehensive study about the productivity in the dam construction management system, and in this research, it has been tried to provide suggestions to improve this situation by stating the necessary generalities and rules. Therefore, improving the system management in water facilities, stating the rules and regulations necessary for greater productivity, and collecting appropriate information for local use in Iran are among the goals of this project. The present research is in order to evaluate the efficiency of dam construction management and ways to improve it. This research was done to answer this question:

How to increase the efficiency of the construction of water facilities?

Ways to increase the efficiency of dam construction

Project planning and control process:

The first way to control time and cost and thus increase productivity is to resort to project planning and control.

To do any activity, you have to plan so that the waste of time and effort reaches its minimum. This point is true for any activity. The schedule is the schedule of the work stage in terms of time. The schedule is a guide for carrying out operations to control the progress of the activities and the possibility of completing them in the desired or necessary time. Setting the schedule in many different stages of construction. It is used from planning to construction and operation and maintenance. Construction phase schedules are used for various purposes before the start of the project and after its completion, as well as during the construction phase.

5. Planning and control steps

First step: defining the project and setting goals

In this step, we define the project and determine the goals to be achieved.

Second step: specify the necessary activities

In this step, we specify the activities that we have to do to achieve the goals of the project. We prepare the project.

Work Breakdown Structure (WBS)

Since specifying all the activities of a project at once is exhausting, we first break the whole work into major activities. Then we can break these major activities into the big activities that make up it in the next step. And again, in the next step, divide the big activities into smaller activities. And this work breakdown can continue for many stages. In fact, the structure of the work breakdown is a pyramid showing the activities of the project (**Figure 1**).

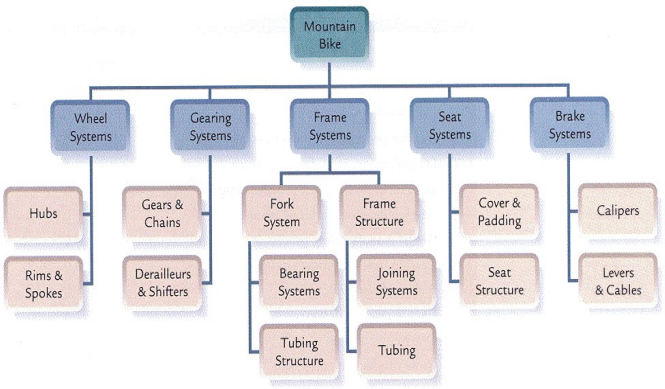

Figure 1. Work-break structure.

The third step: specifying prerequisite relationships and dependencies

In this step, we specify the order of activities and the dependence of each of them on other activities.

Fourth and fifth step: specifying the implementation methods and required people

In this step, we define the implementation methods of each of the activities and the people needed to do them.

Sixth step: Allocation of time and resources

In this step, based on the implementation methods of each of the activities and the people needed to do them, first we allocate time and then, according to the case of other resources such as manpower, machinery, and budget, to each of the activities. Time and resources are often possible using a combination of calculation and experience. In order to calculate time and resources, you can use the analysis of the prices of the items in the price list, and by experimentally adjusting the obtained results, you can reach the appropriate amount.

Seventh step: Considering resource limitations

In this step, according to the limitations we have in the use of resources, we modify the program so that the available resources are used in the best way. In this step, techniques such as resource leveling techniques and time and cost balancing techniques are used.

Eighth step: collecting feedback during the execution and adjustment of the program

In this step, which is done during execution, the program is adjusted and updated using real data collected and execution experiences.

6. Analyze

Due to their importance in terms of exploitation as well as the huge amount of investment in them, dam construction projects are of special importance in completing them on time and with the prescribed cost. Unlike many government projects that are carried out for public benefit purposes (such as the construction of hospitals, schools, and roads), failure to use dams on time will cause a lot of unprofitable damage to the government. At the same time, they can cause heavy physical and financial losses. For this reason, investigating the reasons for the increase in time and cost of dam construction projects is of particular importance.

6.1. Research method

Dam projects are one of the biggest construction projects in the country, which annually allocate significant amounts of the country's construction budget. The design and construction of these projects usually take at least 6 years on average. Therefore, despite the great job creation of these projects, due to the long duration of their implementation, several factors have threatened their successful implementation and have led to the non-achievement of the planned goals in these projects, i.e., completion on time and with the expected cost and quality. Investigating, identifying, and presenting solutions to solve the mentioned causes will result in significant gains for the country's economy. Failure to complete the plan or project on time and with the expected cost will not meet the employer's demands and the goals of the plan or project. An increase in the time and cost of completing the project causes a loss of profits to the user. In many cases, even the excessive delays in the project or plan cause the economic and technical failure of the project. As the duration of the project increases, overhead costs increase. Inflation created in the market increases the costs of performing activities that have not been performed. The possibility of doing similar projects by competitors and losing the market and the justification of the project in the new market increases. New technologies have entered the market, and the possibility of not finding the materials and equipment needed for the project or not justifying their use is increasing. In other words, the losses caused by not completing the project on time impose huge costs on the project or plan. Sometimes these costs are so high that the plan or project is no longer justified. Several factors, such as changes in the amount of work, weakness of the contractor, failure to pay the contractor's demands on time, and many other factors, increase the time and cost of the project. In order to complete the project on time and with the expected cost and to avoid the final losses and

losses caused by delays and increased costs, there is no other way than to investigate and recognize these factors and deal with them appropriately and finally manage them. In this research, the way of time and cost management and, as a result, increasing the efficiency of dam construction have been investigated.

6.2. Method

Today, the uncertainty in estimating the estimated time and cost of industrial projects is considered a major challenge in the science of project management. In this regard, one of the most important and effective ways to solve this problem is risk analysis. In fact, risk management is the systematic application of management policies, procedures, and processes related to risk analysis, evaluation, and control activities. Therefore, before starting the project, project risks must be identified, quantified, and finally, to prevent their occurrence, a suitable strategy to reduce the effects of risk is adopted.

The Project Management Body of Knowledge (PMBOK) is one of the most reliable references in the field of project management. This standard is the result of research by the American Project Management Association (PMI), which has made continuous efforts to develop project management knowledge since 1969. In the field of project risk analysis, the PMBOK standard has been able to provide a process that is very efficient and has made this analysis easier for project managers. Risk analysis in this standard includes qualitative and quantitative risk analysis. Qualitative risk analysis is used to rank the risks and determine the risks whose effects are significant on the project goals. The important point is that the technique (FMEA) can replace the process defined in the standard (PMBOK) in this analysis. Although this technique is used to identify potential error states in a process or product, it can be developed and used to identify and rank possible risks in a project. The advantage of this technique over the standard process is that it performs qualitative analysis in much less time and is more accurate in identifying critical risks. Dam construction projects are among the most important projects of the country, which annually allocate significant amounts of the country's budget, and due to the long duration of their implementation, they always deal with many risks and uncertainties, which lead to non-achievement. On time, the planned goals, the deviation of the cost and time of the project with their estimated value, and also the timely completion of the projects are threatened; therefore, a tool is needed that can effectively analyze the risks with less time and cost. In this research, the researcher aims to analyze the risks of the country's dam construction projects by using a widely used qualitative-quantitative methodology (FMEA), determine their level of effect, and finally, after ranking the risks, identify critical factors.

6.3. Questionnaire design process

In this research, the causes of cost and time increase in the country's dam construction projects and the amount of effect of each factor have been identified from the experts' point of view in two stages as follows.

The first stage is conducting preliminary studies and designing the questionnaire.

At this stage, in order to design a suitable questionnaire, in addition to the above-mentioned projects, a number of ongoing or completed projects that were facing an increase in cost and time were selected and studied completely. In these plans, the items that faced an increase in cost were identified. The reports related to the increase in the time of these projects were studied, and the apparent reasons for the increase in the time in these projects were identified. By referring to the managers and experts involved in these projects, an initial and comprehensive list (about 100 items) of the reasons for the increase in time and cost in these projects was identified and collected. After further investigation, it was determined that some

reasons are common and can be eliminated, and also some of them can be integrated into each other. Therefore, with the final summation of 39 cases as reasons for increasing the cost and time of dam construction projects, they were selected to start the consultation process, and a form was designed for consultation.

Collecting the opinions of the project agents, the second stage

At this stage, managers and a number of knowledgeable and opinionated experts involved in these projects in different factors (employer, consultant, and contractor) were selected, and a survey form was sent to them. Even a large number of them were interviewed in person with explanation and discussion in If the item is selected, the form has been submitted. The number of statistical population selected in this stage according to the table. Ninety questionnaires were distributed among the selected statistical population. After the follow-ups, approximately 50% of the questionnaires were collected and analyzed according to **Table 1**.

Table 1. Question factors.

Total	Contractor	Consultant	The employer	Number of questionnaires
90	30	30	30	Distributed
33	13	15	15	Collected
39	36	50	50	The percentage of collected questionnaires

Studies conducted on the causes of delays

The Union of Large Projects In the investigation of the body of large projects, the reasons for the increase in time and cost in large projects are divided into two categories of reasons related to strategic decisions that are usually made by the senior managers of the organization before signing a contract (including the selection of the type of system). It divides the project (how to choose the factors involved in the project, etc.) and the operational reasons that arise during the implementation of the project (such as lack of materials, weakness of the contractor).

The World Organization of Dams (WCD), during research that it has done in a very general way on 99 projects, states that only half of them have been completed on time, and about 30% of them are from one to two years, and 4 projects are more than it has been delayed for 10 years. The main reasons for the delay in these projects are financial problems, inefficiency of the contractor and construction management, unrealistic schedule, dissatisfaction of manpower, and legal and legal challenges.

As a result

After a comprehensive review of the effect of the causes from the point of view of the main factors of dam construction projects based on the Pareto law, the factors that have 80% of the effect on increasing the time and cost of dam construction projects, according to the effect of each cause, in rows 1 to 26 of the table arranged According to Pareto's law, in most problems, 20% of the causes have 80% of the effects. Although, according to the Pareto law table, the Pareto law is not completely governing in this issue, however, nearly 70% of the causes of time and cost increase in dam construction projects are related to 20 causes, and more than 50% of the effect is related to only 12 causes. Therefore, this table can be used in order to study and provide solutions to eliminate or reduce the causes of time and cost increases in the country's dam construction projects.

6.4. FMEA technique

The failure mode and effect analysis (FMEA) technique was first used in the 1960s in the aviation industry, and then it was widely used in other industries such as automobile manufacturing. The purpose

of this technique is to identify and rank defects and potential defects that occur in a product or process. These defects can occur in the fields of design, testing, quality, production line, marketing, and customer, and their effects can be reduced or eliminated with a planned corrective action. It is possible to use this technique in the form of risk management, and it can be considered as risk failure mode and effect analysis (RFMEA). In fact, FMEA is one of the most widely used techniques for analyzing risk and predicting its effects on risk objectives.

In the technique (RFMEA), in order to rank risks, in addition to the two scales of probability and risk impact, a third criterion called "discovery coefficient" is used, which can make the qualitative risk analysis more accurate. In this technique, the product of two values of probability and impact determines a coefficient called "risk score" of 3. After calculating the risk score, the coefficient or discovery value of 1 should also be determined. This coefficient is "the ability to discover and track a risk along with enough time for a contingency plan in order to respond to the risk". Finally, by multiplying the value of the detection coefficient by the risk score, a new value called the coefficient (RPN) is obtained, and any risk whose (RPN) is higher is given a higher priority.

7. Conclusion

Due to their importance in terms of exploitation and the huge amount of investment in them, dam construction projects are of special importance in completing them on time and with the prescribed cost. Also, dam construction projects are among the most important projects in the country. which annually allocate significant amounts of the country's budget, and due to the long duration of their implementation, they always deal with many risks and uncertainties that lead to not achieving the planned goals on time, cost, and time deviation. The project is threatened with the estimated amount and also the timely completion of the projects, so a tool is needed that can effectively analyze the risks with little time and cost. is to analyze the risks of the country's dam construction projects by using a widely used qualitative-quantitative methodology, FMEA, to determine the level of their effect, and finally, after ranking the risks, to identify the critical factors. Based on the obtained results, out of 14 critical risks, unknown underground factors that could not be predicted during the study period were identified as the most important risks, and finally solutions were provided to resolve these factors to lead to the elimination or reduction of delays and increase interest. and the projects of the country.

General risk factors in dam construction:

One of the studies that can be cited about construction projects in Iran is the report on the evaluation of executive bodies, which is carried out every year by the Vice-Chancellor of Technical and Civil Affairs of the Management and Planning Organization (**Table 2**).

Table 2. General risk factors.

Year 2014	Year 2013	Agents
8/4	9/9	The earth
4/5	5/3	Study and design
7/7	10/8	Executive body
4	7/6	Designer consultant
0/3	0/9	Supervising consultant
5	8/6	Contractor
5/5	6/9	Supplies and machinery
64/7	50	Validity and other reasons

General sources of risk in the project:

Risks are threatening provided that the solutions to face them are not embedded. Also, accepting some risks is considered an opportunity and causes the project elements to work (**Table 3**).

Table 3. General sources of risk.

External sources of risk in the project (uncontrollable)				
Normal	**Social**	**Economic**	**Political**	**Legal**
Atmospheric conditions, fires, floods, earthquakes	Education and culture, seasonal work, strikes, demographic fluctuations	Economic policies, prices, taxes, financing conditions, exchange rate parity	Change in policies, elections, war of threats	Local regulations, permits and approvals change in standards rules
Internal sources in the project (controllable)				
Contracts	**Supply and logistics**	**Human factors**	**Technical documents**	**Management**
Type of contract, short time frame, unrealistic rates of parties' relations	Lack of resources, lack of access to resources, lack of reliance on equipment, insufficient labor force	Productivity, disease, motivation, errors	Superficiality, inaccuracy, lack of complete documents, lack of up-to-date documents	Unrealistic goal of weak control of organizing technology

Author contributions

All authors contributed to this research.

Conflict of interest

The authors declare no conflict of interest.

References

1. Taghipour M, Seraj F, Amir Hassani M, Farahani Kheirabad S. Risk analysis in the management of urban construction projects from the perspective of the employer and the contractor. *International Journal of Organization Leadership* 2015; 4(4): 356–373. doi: 10.33844/ijol.2015.60284
2. Mahboobi M, Taghipour M, Azadeh MA. Assessing ergonomic risk factors using combined data envelopment analysis and conventional methods for an auto parts manufacturer. *Work* 2020; 67(1): 113–128. doi: 10.3233/WOR-203257
3. Taghipour M, Mahboobi M, Gharagozlou H. The impact of ICT on knowledge sharing obstacles in knowledge management process (including case-study). *Iranian Journal of Information Processing and Management* 2016; 31(4): 1049–1074. doi: 10.35050/JIPM010.2016.003
4. Khalilpour M, Kamyabi Y, Nabavi Chshmi SA, Taghipour M. The impact of accountant's ethical approaches on the disclosure quality of corporate social responsibility information an Islamic perspective in Iran. *National Academy of Managerial Staff of Culture and Arts Herald* 2018; 1: 1173–1181. doi: 10.32461/2226-3209.1.2018.178689
5. Mirzaie F, Nazari AA, Zargham Boroujeni H, Taghipour M. The relationship between social bearing capacities with conflict as a result, in the perception of the visiting historical sites. *Journal of Investment and Management* 2015; 4(6): 403–408. doi: 10.11648/j.jim.20150406.24
6. Alamdar Khoolaki M, Naami A, Taghipour M. Effect of integrated marketing communication on brand value with the role of agency's reputation (including case study) (Persian). *Journal of Process Engineering* 2019; 5(11): 30–44.
7. Taghipour M, Safari M, Bagheri H. A survey of BPL technology and feasibility of its application in Iran (Gilan Province). *Science Journal of Circuites, Systems and Signal Processing* 2015; 4(5): 30–40. doi: 10.11648/j.cssp.20150405.11
8. Seddigh MB, Beheshti SMA, Chegini H, Taghipour M. Assessing the effect of FRP system on compressive and shear bending strength of concrete elements. *International Journal of Innovative Research in Science, Engineering and Technology* 2015; 4(11): 11511–11524. doi: 10.15680/IJIRSET.2015.0411119
9. Jalili L, Ghafourian M, Toopal T, Taghipour M. Comparative study of Khaje Rashid al-Din views on Rab-e Rashidi Islamic Utopia and Kevin Lynch ideas. *International Journal of Archaeology* 2015; 3(5): 39–47. doi: 10.11648/j.ija.20150305.11

10. Taghipour M, Vosough A, Azizi D, Abdi J. Insurance performance evaluation using BSC-AHP combined technique. *National Academy of Managerial Staff of Culture and Arts Herald* 2018; 1: 1158–1166. doi: 10.32461/2226-3209.1.2018.178687
11. Rezvani Befrouie A, Ghobadian V, Taghipour M. The design of high-rise building with ecological approach in Iran (Alborz Province). *International Journal of Modern Trends in Engineering and Research* 2015; 2(10): 455–467.
12. Taghipour M, Ganji F, Zolfagharijoo A, et al. The identification and prioritization of effective indices on optimal implementation of customer relationship management using TOPSIS, AHP methods (case study: Pasargad bank). *Management* 2020; 3(4): 43–60. doi: 10.31058/j.mana.2020.34004
13. Taghipour M, Yazdi H. Seismic analysis (non-linear static analysis (pushover) and nonlinear dynamic) on cable-stayed bridge. *American Journal of Civil Engineering* 2015; 3(5): 129–139. doi: 10.11648/j.ajce.20150305.11
14. Taghipour M, Barzegar P, Mahboobi M, Mohammadi S. Investigating the relationship between competitive strategies and corporates performance—Case study: Parsian Banks of Tehran. *Management* 2020; 3(4): 13–28. doi: 10.31058/j.mana.2020.34002
15. Taghipour M, Moosavi SA. A look at gas turbine vibration condition monitoring in region 3 of gas transmission operation. *Journal of Environmental Science, Computer Science and Engineering & Technology* 2020; 9(3): 423–432. doi: 10.24214/jecet.C.9.3.42332
16. Rahamni M, Vaziri Shams S, Abedi V, Taghipour M. Providing health, safety and environmental management (HSE) program in metal mining industry (including case study). *Management* 2020; 4(3): 14–35. doi: 10.31058/j.mana.2021.43002
17. Taghipour M, Vaezi M. Safe power outlet. *Electrical Science & Engineering* 2020; 2(2): 5–10. doi: 10.30564/ese.v2i2.2464
18. Azarian R, Taghipour M. The impact of implementing inclusive quality management on organizational trust (case study: Education). *Journal of Multidisciplinary Engineering Science Studies* 2020; 6(7): 3376–3383.
19. Mohammadi S, Taghipour M, Mahboobi M. Investigating the role and impact of using ICT tools on evaluating the performance of service organizations (Persian). *Iranian Journal of Information Processing and Management* 2021; 37(1): 1–26. doi: 10.52547/JIPM.37.1.1
20. Abdi J, Safariyan S, Usefi R, Taghipour M. Predicting entrepreneurial marketing through strategic planning (including case study) (Persian). *Educational Administration Research Quarterly* 2019; 10(39): 127–146.
21. Khorasani Z, Taghipour M. The location of industrial complex using combined model of fuzzy multiple criteria decision making (including case study). *International Journal of Innovation Scientific Research and Review* 2020; 2(7): 268–280.
22. Taghipour M, Sharifzadeh S, Seraj F. Risk assessment and analysis of the state DAM construction projects using FMEA technique. *Trends in Life Sciences an International Peer-Reviewed Journal* 2015; 4(2).
23. Hoseinpour Z, Taghipour M, Hassan Beigi J, Mahboobi M. The problem solving of bi-objective hybrid production with the possibility of production outsourcing through Imperialist Algorithm, NSGA-II, GAPSO Hybrid Algorithms. *Turkish Journal of Computer and Mathematics Education* 2021; 12(13): 8090–8111.
24. Taghipour M, Ahmadi Sarchoghaei J. Evaluation of tourist attractions in Borujerd County with emphasis on development of new markets by using Topsis Model. *Science Journal of Business and Management* 2015; 3(5): 175–189. doi: 10.11648/j.sjbm.20150305.16
25. Safdarpour S, Pourkhosravani P, Taghipour M. The effect of government support on innovation ability (including a case study). *Journal of Multidisciplinary Engineering Science and Research* 2023; 2(6): 233–237.
26. Ganjali R, Negaresh Z, Taghipour M. Strategic analysis of household hazardous waste reduction. *International Journal of Educational Foundations and Management* 2023; 11(4): 1–10.
27. Taghipour M, Safdarpour S, Taherian P, et al. The impact of managerial factors on increasing the productivity of low-level employees (including case study). *Management* 2022; 5(2): 1–9. doi: 10.31058/j.mana.2022.52001
28. Ganjali R, Ohadi Digesaraei D, Taghipour M. Investigating the relationship between environmental awareness and the level of education and occupation of people. *International Journal of Educational Foundations and Management* 2022; 11(4): 1–5.
29. Baghipour Sarami F, Bozorgiamiri A, Mououdi MA, Taghipour M. Modeling of nurses' shift work schedules according to ergonomics: A case study in Imam Sajjad (As) Hospital of Ramsar (Persian). *Journal of Ergonomics* 2016; 4(1): 1–12. doi: 10.20286/joe-04011
30. Taghipour M, Habibi Machiani H, Amin M. The impact of working capital management on the performance of firms listed in Tehran Stock Exchange (TSE). *Journal of Multidisciplinary Engineering Science and Technology* 2020; 7(6): 12146–12154.
31. Akbarnezhadbaei K, Mohammadi M, Kouloubandi A, Taghipour M. Modeling the application of knowledge management system in order to improve the technology governance in the automotive industry of

Iran using the data mining environment (Persian). *Educational Administration Research Quarterly* 2023; 14(55): 151–165.
32. Akbarnezhadbaei K, Mohammadi M, Kouloubandi A, Taghipour M. Determining a model for evaluating the knowledge management system in order to improve industries with the focus on educational technology and applying data mining concepts. *The Journal of Modern Thoughts in Education* 2023; in press.
33. Molavi A, Taghipour M. A survey on electrical cars advantages. *Progress in Energy & Fuels* 2023; 12(1): 1–14. doi: 10.18282/pef.v12i1.3351
34. Safdarpour S, Pourkhosravani P, Rooholamini V, Taghipour M. The effect of communication on learning ability (including a case study). *Management* 2022; 5(4): 46–54. doi: 10.31058/j.mana.2022.54006