

# Project portfolio management in water distribution pipelines (Case study: water distribution pipeline 2 of Qasr-e Shirin project)

Mahmoud Tavakkoli harandi, Alireza Mmirjalili, Hamidreza Amiri  
Department of civil engineering, yazd branch,islamic azad university,yazd

Received: 18, February, 2020

Accepted: 12, April, 2020

Online Published: 28, Jun, 2020

## Abstract

Lack of proper strategies in the competitive space of project-based companies has moved them toward the predetermined objectives that a proper strategy is a principal need. Project portfolio management strategy means the ability of effective supervision and management to guarantee the companies' projects temporarily. The dynamism of the project portfolio management has prioritized the companies' projects and attributed resources based on the company's strategy. Therefore, time, financial resources, and human resources can be saved.

Several questions were proposed in this research based on the principal problems of projects and were given to the project-based distribution pipeline companies. Participants were divided into several groups after collecting them based on their job rank, background, education, and statistical population. Each group was scored based on the group condition, then the obtained results were tested by spss software. In addition, the project selection, execution, and companies' strategies were examined. The reasons for problems in distribution pipeline companies can be studied according to the obtained results. These reasons include the lack of an integrated strategy to develop the companies' objectives which brought problems of costs increase, overwork, risk increase, and project execution time increase. Moreover, problems of regulations and caused problems by entrepreneurs and contractors' weakness are against the distribution of pipeline projects.

**Keywords:** projects portfolio, distribution pipelines, strategy, project selection

## 1. INTRODUCTION

Project portfolio management can be used from the scientific view as the policy of solving the problems of distribution pipelines because of many problems in the distribution pipeline project management. Project portfolio management strategy is an approach whereby project-based organization projects can be aligned to the objectives of these organizations' research. The target price of projects, project execution time, and risk can be minimized using this scientific approach. In addition, integrated planning can prevent re-work while projects execution and wrong managerial decisions.

Selecting the prior projects is an essential need of project-based companies, and what signifies the need to project portfolio management is ensuring that projects are executed aligned with strategic objectives (1-3). Organizations attending to the alignment of projects and organizational objectives have been more successful and update their list by projects portfolio management and change if needed (4, 5). Researchers have selected the long-term objectives and strategies of organization as the main criteria for organizational projects portfolio in most theories and research (6-10). These objectives bring profitability for the organization as well as satisfy the legal requirements of the organization. Such factors have obtained the maximum attention in the implementation of organizations strategy by researchers through various studies (11-14) in different eras including inappropriate strategy, inefficient organizational structure, weak communication between project involved factors, resource constraints, improper implementation methods, improper planning, and lack of coordination between project goals and execution. The problems of distribution pipeline companies and the

effects of these problems are studied in the next of this research.

Miller (1997) studied the strategy implementation process in 6 private and public organizations. He didn't offer a specific model but identified 10 key factors in strategy implementation based on his studies in the examined organizations and divided them into enablers and administrators. The cognitive factors include support, measurable, specificity, a culture of acceptance, assistance, and cooperation, and the enablers include proximity, access priority to resources, dynamics, and structure facility. According to Miller's idea, perceptive factors are highly more important and vital than other factors in implementing strategic decisions [15]. In the four-step model of Nobel (1999), the implementation process includes 4 steps of pre-implementation, organizing implementation, implementation process management and maximizing performance that each step is itself divided into various parts[16]. The pre-implementation step includes participation in strategy formulation, focus on performances, and education. In each step of implementation organization, factors of conflicts, implementation leadership, implementation pan, abilities, and networks and in each step of implementation process management, the perceptive factors of communication, employees, and definite objectives have been the effective key factors on strategy implementation [17]. Sudder [1973] obtained the criteria for proper model selection in his research on many organizations and companies[18]. Meridith [2000] added another criterion as follows [19].

The main problem to use portfolio management in civil projects is risk reduction through versification and the use of synergy in different existing projects. Most civil

companies are specialized in one civil field (for example road or building); therefore, versification may not be interesting because this obliges them to have a specialty in several civil fields [20]. Turner [2000] stated that most projects are a part of a design or portfolio [21]. Cooper suggested strategy [2005] has 2 levels. The first level is strategic decisions of portfolio and is proper for organizations that want to divide projects into several sub-groups and groups. Organizations can have an aligned and balanced portfolio with the company's strategy for each strategic compartments that occurred based on the company's strategic resources. The second level known as technical decisions of the portfolio is the project selection process. Various tools and technics are accessible at this level to select correct projects and are used in each sub-group following each strategic compartments[22]. Garey (2001) attributed resources to the organization's projects based on the project's alignment with the organization's strategic objectives. Since the organization's strategic objectives are based on the type of organization (profit/non-profit), existential philosophy of the organization, intra-organizational needs, and changes in the environment around the organization, organizations have high reliability to consider its strategic issues [23]. Abunia suggested framework by studying various frameworks in other sectors and the inclusion of civil companies' structures and needs [24]. Okomus [2010] studied his suggested model in two international companies and the effect of the mentioned components was confirmed in the strategy implementation process in both companies [25]. Maleki et al. (2012) provided a framework that first scored and prioritized the strategic planning for the construction companies using general electric portfolio matrix, feasibility analysis model, and Fuzzy approach, strategic options in the construction industry. Then, the proposed projects are prioritized and selected by the experts in a way that follows the goals and strategy of the organization [26]. Although the strategic objectives of the organization have guided its objectives of the specific cases, it is essential to prioritize the strategic objectives to focus more on issues of budgeting, attributing resources, etc. An interesting point is designing the competent mechanism and structure to continue this discussion which is usually solved by the interacted portfolio management committee with the senior management of the organization [27]. Sheikhzadeh et al. (2013) provided a model to study the existence philosophy of the strategy-based models in organization projects portfolio selection by two different approaches [28]. Strategic alignment can be obtained through the scoring model when the downward approach is the only designed method. Therefore, it is assured that the final portfolio of projects shows the organization's strategy. Actually, the costs are spent reflects the organization strategy. The strategic buckets model uses the simple principles of comparing strategic implementation by expending money in specific projects [29]. Now, project portfolio management in water distribution pipelines is studied.

## 2. METHODOLOGY

Activities in this step are as follows. Several water-distribution pipeline designs executing or ending which are faced with the increased cost and time were selected, and a list of comprehensive sit of projects was identified and collected by referring to involved managers and experts in these projects. It was indicated by more studies that some reasons are mutual and removable as well some others can be combined. Water distribution pipeline 2 of Qasr-e Shirin project that is a part of huge tropical design aims at preventing waste, supply, and storage of water for urban, agricultural, and industrial usage with 445 kilometers length (including 170 kilometers of canals, 45 kilometers of tunnels, 230 kilometers of pipelines and 3 units of pumping stations) with duty of water transmission from Ezgeleh dam to the tropical and border regions of Kermanshah and Ilam provinces. The project is divided to 4 parts based on high length and extension that part 2 is defined as the output of long open tunnel in Sarpol Zahab city to the other side of Kangakush River with a length of 45 km with three discrete lines with diameters of 2400, 2000, 1800, and 1600 mm.

### DATA COLLECTION

In this step, first, the involved managers and several experts in these designs and various projects (entrepreneurs, counselor, and contractor) were selected, the survey forms were sent to them, and many of them were delivered in-person with description and discussion of selected items on the form. Several statistical populations were shown later and 40 questionnaires were distributed in the selected statistical population. All questionnaires were collected and analyzed after following up.

The questionnaire was prepared to search the performance of distribution pipeline companies about the project selection, project prioritizations, various tact of companies to decrease the project time, cost, and risk, and it was given to the distribution pipeline companies.

#### First questionnaire:

The first questionnaire has the following questions:

First question:

How projects are selected in a company? What matters are considered to select?

1. Project profitability is considered.
2. The company's specialty in project selection is important.
3. The project location is considered.

Second question:

What measures does the company consider to reduce project implementation time?

1. It examines the schedule in each step.
2. It increases the working hours.
3. Work continues on holidays.
4. The specialized workforce is used.

Third question:

What measures does the company consider to reduce the risk of project implementation?

1. It uses a specialized and efficient workforce.
2. It considered financial resources.

3. It considers the delivery and maintenance conditions of the workshop.

Fourth question

What measures does the company consider to reduce that target costs of projects?

1. It uses a low-price workforce.
2. It uses cheaper and similar materials.
3. It prevents rework by considering conditions.

Fifth question

How would be the attribution and prioritization of the company's resources when there are several projects simultaneously?

1. The project in the final step
2. The project in the first step
3. The project with more profitability
4. The project ends sooner
5. The project ends later

Sixth question

Is a similar budget attributed to all projects? Are resources attributed to the project based on their profitability?

1. A similar budget is considered for all projects.
2. More budget is considered for projects with more profitability.
3. More budget is considered for projects to end sooner.
4. More budget is considered for projects end later.

Seventh question

1. How are the contracts for distribution pipeline projects?

2. Management agreement contracts
3. Contract based on the general estimation with fixed price
4. Contract-based on building area (m<sup>2</sup>)
5. Turnkey contract
6. Engineering, procurement, and implementation contract

Eighth question

Do you reevaluate the resources after accepting the projects?

No.	In distribution pipeline companies	The effectiveness of this issue on the performance of water distribution pipeline companies	Your answer and suggestion
1	How is the effect of inconstancy of various involved parts in the project on cost of its implementation?		
2	How is the effect of inconstancy of various involved parts in the project on duration of its implementation?		
3	How is the effect of environmental conditions on the project implementation?		
4	How is the effect of lack of timely supply of projects credits		
5	How is the specialty and skills of the relevant human force to the project?		
6	How is the resistance of project trams for accurate and regular reporting?		

1. They are evaluated if a problem occurs.
2. The project is evaluated before and after each step.
3. Resources are always reevaluated and planned.
4. Valuation is not done.

Ninth question

Do you check which project should be stopped and the alternative projects should be started while the implementation of projects?

1. Another project is replaced in the case of loss.
2. The problems are examined but the project doesn't stop

Tenth question

Do you check while project implementation which project is better not be finished or leave at that condition?

1. Projects are always checked and left in the case of loss.
2. The end of projects is important.

Eleventh question

Do you check while your organization project implementation which one is losing?

1. Projects are evaluated in each step and the weakness of entrepreneurs, engineering, and workforce management is examined.
2. Projects are evaluated every several months and the weakness of entrepreneurs, engineering, and workforce management are examined.
3. The project is analyzed only at the beginning.

**Second questionnaire:**

The effectiveness of factors is examined in this questionnaire. A five-point Likert spectrum is used like the following table to study this effectiveness.

Completely effective	Very effective	Effective	Relatively effective	Non-effective
9	7	5	3	1

In this questionnaire, the effect of 6 factors is studied on the performance of water distribution pipeline company.

It was tried in questionnaire 2 to study the problems of distribution pipeline companies and their importance; finally, to indicate the importance of these problems for each person and the priority of solutions for companies.

The effect of inconsistency in various involved parts in project is in the project cost, project implementation time, the effect of environmental conditions in project implementation, the effect of the lack of timely project funds, specialty, and skills of the related human force with project, the resistance of project team in the accurate and regular reporting in distribution pipeline companies.

### STATICAL POPULATION

The questionnaire was prepared and given to the distribution pipeline companies to study the performance of these companies about the project selection, prioritizes, various measures to reduce the project costs and risk while implementation.

The obtained results are examined in this part:

Frequency descriptive indexes and percentages are reported in Table 1 to study the serving years of participants in the project

Table 1: descriptive indexes of serving years

No.	Serving years	Frequency	Percentage
1	1-5	10	25%
2	5-10	9	22.5%
3	10-15	10	25%
4	15-20	5	12.5%
5	20-25	0	0%
6	25-30	4	10%
7	30-35	2	5%

According to Table 1, 10 people (25%) have 1-5 serving years, 9 people (22.5%) have 5-10 serving years, 10 people (25%) have 10-15 serving years, 5 people (12.5%) have 15-20 serving years, 0 person (0%) have 20-25 serving years, 4 people (10%) have 25-30 serving years, and 2 people (5%) have 30-35 serving years' background.

Frequency descriptive indexes and percentage were used whose results are reported in Table 2 to study the education level of participants in the project.

Table 2: descriptive indexes of education level

Education level	Frequency	Percentage
diploma	2	5%
Associated degree	1	2.5%
Bachelor	24	60%
MSc	13	32.5%
Total	40	100%

As seen in Table 2, 2 out of 40 participants (5%) had diploma, 1 (2.5%) had associated degree, 24 people (60%) had bachelor, and 13 people (32.5%) had MSc. Therefore, the education level of most participants is bachelor. Frequency descriptive indexes and percentage were used whose results are reported in Table 3 to study the job background of participants in the project.

Table 3: descriptive indexes of participants' job

job	Frequency	Percentage
deputy	2	5%

CEO	17	42.5%
Member of board of directors	4	10%
Supervisor engineer	3	7.5%
Project engineer	6	
others	8	20%
Total	40	100%

As it is observed in Table 3, 2 out of 40 participants (5%) are deputy, 17 people (42.5%) are CEO, 4 people (10%) are the member of board of directors, 3 people (7.5%) are supervisor engineer, 6 people (15%) are project engineer, and 8 people (20%) are employed in other jobs. Therefore, the maximum participants in this research are CEO and the minimum participants are a member of the board of directors.

### 3.RESULTS AND DISCUSSION

The general trend of the projected-based companies of the province can be known according to the proposed questions. Most companies considered the profitability and specialty of the company in the project to prioritize the projects. Most companies evaluate scheduling in each step to reduce the project implementation time. Moreover, they try to prevent reworking reduce costs, using the efficient and specialized workforce is a policy with the maximum application in the distribution pipeline companies to reduce the project implementation risk. According to the ideas of most participants, prioritization, and attribution of projects resources should have the maximum budget for the project with the maximum profitability. Moreover, decisions of distribution pipeline companies while loss can be examined.

Analysis of the questions of questionnaire 1

Analysis of the first question of questionnaire 1

Table 4: descriptive indexes of the first question

Question answer	Frequency	Percentage
Choice 1	17	42.5%
Choice 2	17	42.5%
Choice 3	6	15%
Total	40	100%

As it is observed in Table 4, 17 people out of 40 (42.5%) believe that the project profitability is considered. moreover, 17 people (42.5%) believe that specialty is important for project selection. 6 people (15%) believe that it is considered for project selection.

Analysis the second question of questionnaire 1

Table 5: descriptive indexes of the second question

Question answer	Frequency	Percentage
Choice 1	16	40%
Choice 2	9	22.5%
Choice 3	5	12.5%
Choice 4	10	25%
Total	40	100%

As it is observed in Table 5, 16 out of 40 participants in this research (40%) believe that the scheduling of each step is examined to reduce the project implementation

time. 9 people (22.5%) increased work hours. 5 people (12.5%) responded to work on holidays. In addition, 10 people (25%) believe in employing the specialized human force to reduce the project implementation time. Therefore, most people examine the scheduling plant to reduce project implementation time. Working on holidays is a policy having the minimum application to reduce the project implementation time.

Analysis of the third question of questionnaire 1

Table 6: descriptive indexes of the third question

Question answer	Frequency	Percentage
Choice 1	25	62.5%
Choice 2	11	27.5%
Choice 3	4	10%
Total	40	100%

As is observed in Table 6, 25 people out of 40 (62.5%) believe that the specialized and efficient workforce is used to reduce the project risk. moreover, 11 people (27.5%) considered financial resources. 4 people (10%) have introduced the delivery and maintenance conditions of the workshop as a policy to reduce the project risk.

Analysis of the fourth question of questionnaire 1

Table 7: descriptive indexes of the fourth question

Question answer	Frequency	Percentage
Choice 1	9	22.5%
Choice 2	5	12.5%
Choice 3	26	65%
Total	40	100%

As it is observed in Table 7, 9 people out of 40 (22.5%) believe that low-cost human force is used to reduce the target cost of projects. moreover, 5 people (12.5%) used similar but cheaper materials. 26 people (65%) prevent rework by considering the conditions. Thus, most people prevent reworking to reduce the project cost by considering the conditions and using similar but cheaper materials is a policy to reduce the target cost of projects.

Analysis of the fifth question of questionnaire 1

Table 8: descriptive indexes of the fifth question

Question answer	Frequency	Percentage
Choice 1	6	15%
Choice 2	1	2.5%
Choice 3	22	55%
Choice 4	9	22.5%
Choice 5	2	5%
Total	40	100%

As it is observed in Table 8, 6 people out of 40 (15%) believe that the project in the final step is selected to prioritize and attribute the company's resources while having several simultaneous projects. 1 person (2.5%) select the project in the beginning step. 22 people (55%) selected the project with higher profitability. 9 people (22.5%) selected a project ending sooner. Therefore, most people select projects with higher profitability to prioritize and attribute simultaneous projects, and the project in the beginning step is indicated as a policy with

the minimum prioritization and attribution of the company's resources if several projects are implemented simultaneously.

Analysis of the sixth question of questionnaire 1

Table 9: descriptive indexes of the sixth question

Question answer	Frequency	Percentage
Choice 1	2	5%
Choice 2	23	57.5%
Choice 3	12	30%
Choice 4	3	7.5%
Total	40	100%

As is observed in Table 9, 2 people out of 40 (5%) believe that an equal budget should be considered for all the simultaneous projects. 23 people (57%) believe that more budget should be considered for a project with more profitability. 12 people (30%) believe that more budget should be considered for the project ending sooner. 3 people (7.5%) believe that more budget is considered for projects ending later. Therefore, most participants considered more budget for the project with higher profitability among the projects implemented simultaneously. In addition, considering a similar budget for all projects is considered as a policy with minimum application in the company's budgeting while several projects are implemented simultaneously.

Analysis of the seventh question in questionnaire 1

Table 10: descriptive indexes of the seventh question

Question answer	frequency	percentage
Choice 1	29	72.5%
Choice 2	3	7.5%
Choice 3	2	5%
Choice 4	3	7.5%
Choice 5	2	5%
Choice 6	1	2.5%
Total	40	100%

As is seen in table 10, 20 people out of 40 participants (72.5%) of this research use contract agreement based on the cost list. 3 people (7.5%) use management contract agreements. 2 people (5%) use general estimation contracts with fixed prices. 3 people (7.5%) uses a contract based on building area (m<sup>2</sup>). 2 people (5%) believe in the use of the turnkey method. 1 person (2.5%) uses engineering contracts, procurement, and implementation. Therefore, most people use contract agreements based on the cost list, and the turnkey method is indicated as the minimum applied method.

Analysis of the eighth question of questionnaire 1

Table 11: descriptive indexes of the eighth question

Question answer	frequency	percentage
Choice 1	2	5%
Choice 2	15	37.5%
Choice 3	22	55%
Choice 4	1	2.5%
Total	40	100%

As is observed in Table 11, 2 out of 40 participants (5%) in this research believe that the problem is evaluated if occurs. 15 people (37.5%) evaluate before and after each

step. 22 people (55%) believe that resources should be evaluated. 1 person (2.5%) doesn't evaluate resources after accepting the project. Therefore, most people evaluate projects after accepting it to have essential plans to prioritize resources. Only 1 out of 40 participants don't evaluate the project after its acceptance.

Analysis of the ninth question of questionnaire 1

Table 12: descriptive indexes of the ninth question

Question answer	frequency	percentage
Choice 1	19	47.5%
Choice 2	21	52.5%
Total	40	100%

As it is observed in table 12, 19 out of 40 participants (47.5%) always examine the project and stop them in case of loss. 21 people (52.5%) examined the problems after their occurrence but don't stop the project.

Analysis of the tenth question of questionnaire 1

Choice 2	14	35%
Total	40	100%

As it is observed in table 13, 26 out of 40 participants (65%) examine the project and assign it in case of loss. 14 people (35%) say finishing the projects is important. Therefore, most people always evaluate resources during project implementation.

Analysis of the eleventh question of questionnaire 1

Table 14: descriptive indexes of the 11th question

Question answer	frequency	percentage
Choice 1	28	70%
Choice 2	11	27.5%
Choice 3	1	2.5%
Total	40	100%

As it is observed in Table 14, 28 out of 40 participants of this research (70%) evaluate the project in each step and examine the weakness of entrepreneur, engineers, and human force. 11 people (27%) evaluate projects every several months and examine the weakness of entrepreneurs, engineers, and human force. Only 1 person (2.5%) analyzes projects at first. The frequency distribution of the 11th question is shown in figure 1.

Analysis of the first question of questionnaire 2

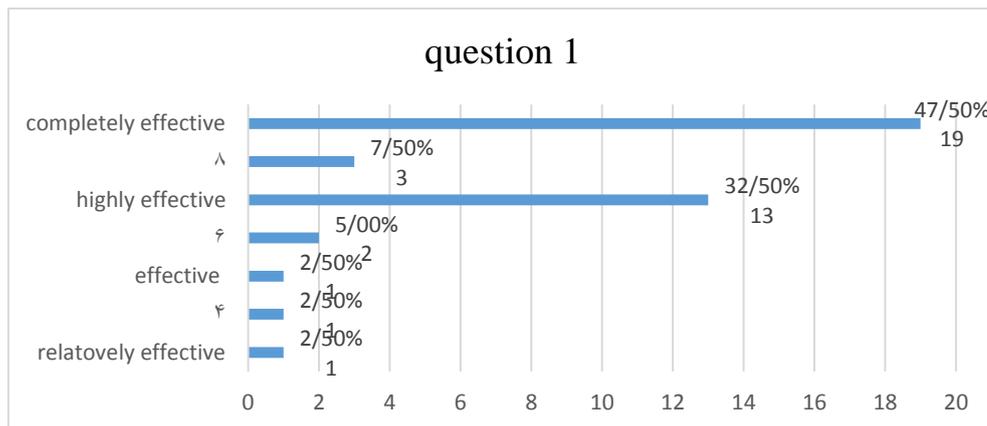


Fig 1: frequency of question 1

Analysis of the second question of questionnaire 2

The timely finishing with the determined cost of implementing distribution pipelines is so important

because of their utilization as well as the big fortune of investment. Thus, it is essential to examine the effect of the inconsistency of various sectors of the involved factors on the cost and finishing time of projects.

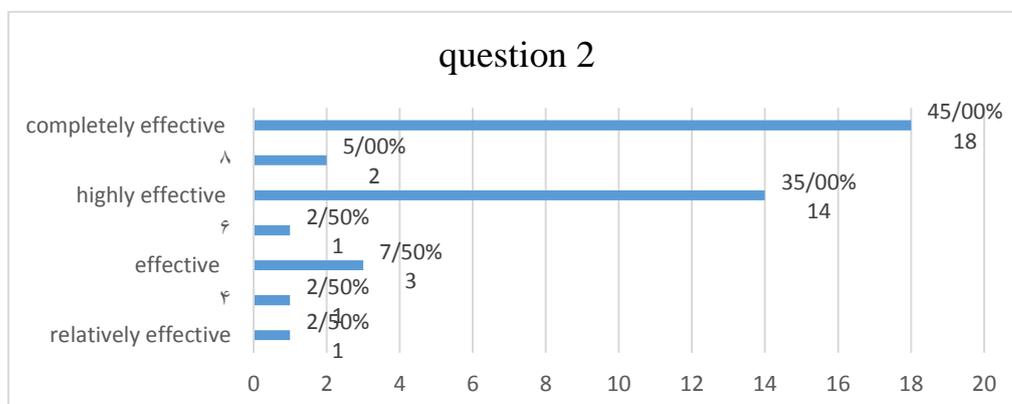


Fig 2: frequency of the second question

Table 13: descriptive indexes of the tenth question

Question answer	frequency	Percentage
Choice 1	26	65%

Analysis of the third question of questionnaire 2

Excessive costs and delays have increased are the main problems involving with the big projects, problems of a

project have many reasons such as non-consideration of the principal elements of project at the beginning of planning, the optimistic initial estimation, estimation in calculation instead of precise calculations, changes in

the definition and objective of the projects, and improper climate.

Among these factors of distribution pipelines, climate, particularly raining and temperature, are significantly important because they influence the path construction and make a delay or stop the project.

Raining and welding and

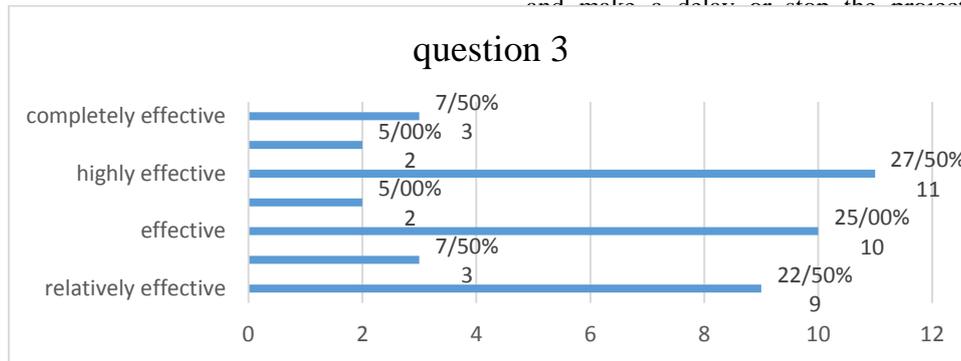


Fig 3: frequency of the third question

A group that got score 5 in the figure has the maximum value based on tee scores and percentage of participants group and frequency figure.

Analysis of the fourth question of questionnaire 2  
The required schedule is needed to start a project with correct development, and these schedules are based on

human and financial resources and needs. The financial resources of each part of the project are determined at the beginning of the project. Lack of timely supply of credits stops a part of the project and in some cases the whole project. Later projects stop brings a great loss and to the organization

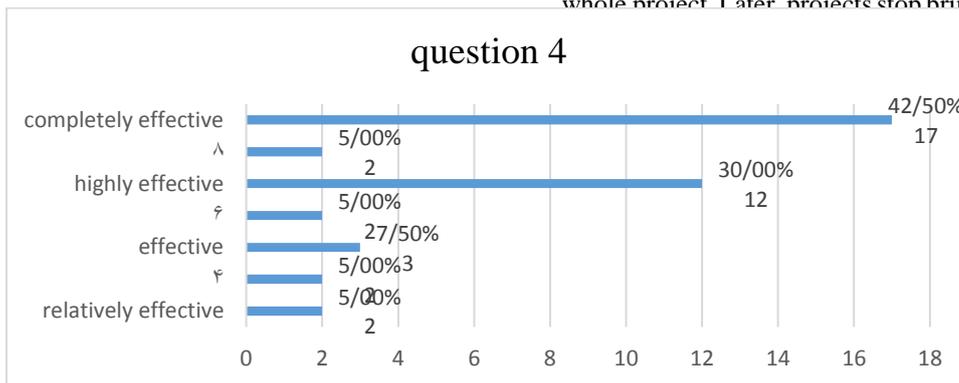


Fig 4: frequency of the fourth question

A group that got score 10 in the figure has the maximum value based on tee scores and percentage of participants group and frequency figure.

Analysis of the fifth question of questionnaire 2

The human resources of projects mean what we do to use the existed human resources maximally in the success or failure of the

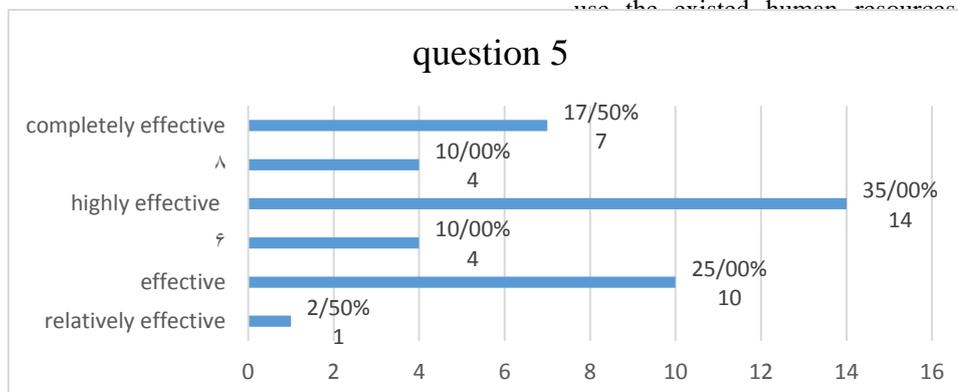


Fig 5: frequency of the fifth question

A group that got score 10 in the figure has the maximum value based on the scores and percentage of participants' group and frequency figure.

Analysis of the sixth question of the questionnaire 2. One factor for the inefficiency of project portfolio management is the resistance of project teams for accurate and regular reporting. Project portfolio

management is a dynamic system whose accurate performance needs timely and accurate reporting on the involved teams in the project implementation. The project development and loss and benefits of projects can be considered only in this way. If needed, the projects can be added or removed from the management portfolio cycle.

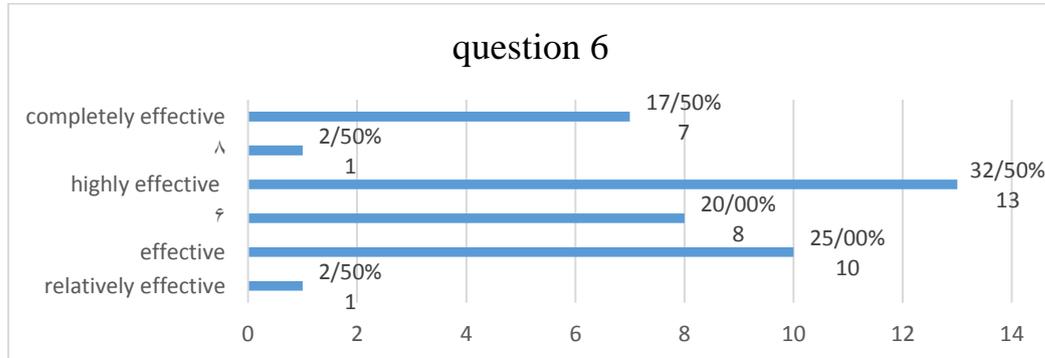


Fig 6: frequency of the sixth question

A group that got score in the figure has the maximum value based on the scores and percentage of participants' group and frequency figure.

#### 4. CONCLUSION

Since 80% of cost and delay increases are caused by 20% of the reason, it is better to contemplate deeply on 20% to solve the reasons, and several policies have been considered to remove them.

It is better to attend to the company's specialty

- and authorities' skills to select projects
- Using specialized human resources to reduce risk
- Prevent reworking for various reasons while the project will reduce the targeted cost.
- Attributing more budget for projects with the label of "high priority" in project portfolio based on geography and distribution of project human force
- Prioritization of projects based on their alignment with the company's strategy
- Attention to the projects return while prioritization and attribution of resources
- Preventing simultaneous design and implementation of projects which obscured the scope of work and continuous changes to the project
- The permanent study of project scheduling and its adaption with the initial schedule
- The precise and all-aspect analysis of the project cost and preventing the cost estimation method
- The precise evaluation of the project financial resources dynamically
- Using the specialized human force which prevents the time and cost waste.
- Opening distribution pipeline projects in proper seasons which increase the project strength, speed, and quality of the task. The proper seasons for this task is for raining in summer and spring as well as months in winter and fall with less snowing and raining.

- Attention to the project geographical situation and local facilities neglecting which will slow down the supportive and implementation activities.
- Studying the loss of the executing project in each step and management weakness
- Evaluating projects dynamically and rescheduling while problem occurrences
- The caused problems by regulations such as delay in announcement of adjustment and difference indicators by management and planning organization which lead to reducing the financial power of contractors.

#### 5. REFERENCES

1. Jafari Kang, M., Khodadadifard, M., & Afandizadeh, S. (2017). Providing a Decision-Making Method for Evaluation of Exclusive BRT lanes Implementation Using Benefit-Cost Analysis-Case Study: Tehran BRT line 4. *Journal of Civil Engineering and Materials Application*, 1(1), 8-15.
2. Bredecke, C. M., DeOreo, W. B., Payton, E. A., & Rozaklis, L. T. (1989). Network models of water rights and system operations. *Journal of Water Resources Planning and Management*, 115(5), 684-696.
3. Bakker, K., & Hendriks, R. (2019). Contested Knowledges in Hydroelectric Project Assessment: The Case of Canada's Site C Project. *Water*, 11(3), 406.
4. Naseri, F., & Bagherzadeh Khalkhali, A. (2018). Evaluation of Seismic Performance of Concrete Gravity Dams Under Soil-structure-reservoir Interaction Exposed to Vertical Component of Near-field Earthquakes During Impounding Case study: Pine Flat Dam. *Journal of civil Engineering and Materials Application*, 2(4), 181-191.
5. Lee, S., Shin, S., Judi, D. R., McPherson, T., & Burian, S. J. (2019). Criticality Analysis of a Water Distribution System Considering Both Economic Consequences and Hydraulic Loss Using Modern Portfolio Theory. *Water*, 11(6), 1222.

6. McShane, B. (2019). The Water Power Technologies Office and Powering the Blue Economy.
7. Liu, L., Hejazi, M., Iyer, G., & Forman, B. A. (2019). Implications of water constraints on electricity capacity expansion in the United States. *Nature Sustainability*, 2(3), 206-213.
8. Cardoso Jr, R. A. F., & Hoffmann, A. S. (2019). Environmental licensing for transmission systems and electricity sector planning in Brazil. *Energy Policy*, 132, 1155-1162.
9. Okaru, C. A. (2019). *Evaluation of Project Management tools application in Usandeeep water Development Project* (Doctoral dissertation, Federal University of Technology, Owerri).
10. Guan, X., Mascaro, G., Sampson, D., & Maciejewski, R. (2020). A metropolitan scale water management analysis of the food-energy-water nexus. *Science of The Total Environment*, 701, 134478.
11. Zipper, S. C., Jaramillo, F., Wang- Erlandsson, L., Cornell, S. E., Gleeson, T., Porkka, M., ... & Hoff, H. (2019). Integrating the water planetary boundary with water management from local to global scales. *Earth's Future*, e2019EF001377.
12. Miller, D. (1997). *Capitalism: an ethnographic approach*. Bloomsbury Academic.
13. Nobel, P. S. (1999). *Physicochemical & environmental plant physiology*. Academic press.
14. Saeedi, M. (2017). Study the Effects of Constructions New Techniques and Technologies on Time, Cost and Quality of Construction Projects from the Perspective of Construction Management. *Journal of civil Engineering and Materials Application*, 1(2), 61-76.
15. Lie, S. O., & Schofield, B. (1973). Inactivation of lysosomal function in normal cultured human fibroblasts by chloroquine. *Biochemical pharmacology*, 22(23), 3109-3114.
16. Fava, M., Rankin, M. A., Wright, E. C., Alpert, J. E., Nierenberg, A. A., Pava, J., & Rosenbaum, J. F. (2000). Anxiety disorders in major depression. *Comprehensive psychiatry*, 41(2), 97-102.
17. Kennedy, M. D. (1990). The constitution of critical intellectuals: Polish physicians, peace activists and democratic civil society.
18. Turner, N. J., Ignace, M. B., & Ignace, R. (2000). Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia. *Ecological applications*, 10(5), 1275-1287.
19. Cooper, R., Ellem, B., Briggs, C., & Van Den Broek, D. (2009). Anti-unionism, employer strategy, and the Australian state, 1996–2005. *Labor Studies Journal*, 34(3), 339-362.
20. Visser, M., Rehbein, S., & Wiedemann, C. (2001). Species of flea (Siphonaptera) infesting pets and hedgehogs in Germany. *Journal of Veterinary Medicine, Series B*, 48(3), 197-202.
21. Midori, I. N. D. O. H. (1992). Classroom Context in Japanese Language Teaching. *development*, 124.
22. Yasarata, M., Altinay, L., Burns, P., & Okumus, F. (2010). Politics and sustainable tourism development– Can they co-exist? Voices from North Cyprus. *Tourism Management*, 31(3), 345-356.
23. Saemi, E., Porter, J. M., Ghotbi-Varzaneh, A., Zarghami, M., & Maleki, F. (2012). Knowledge of results after relatively good trials enhances self-efficacy and motor learning. *Psychology of Sport and Exercise*, 13(4), 378-382.
24. Anitori, L., Maleki, A., Otten, M., Baraniuk, R. G., & Hoogeboom, P. (2012). Design and analysis of compressed sensing radar detectors. *IEEE Transactions on Signal Processing*, 61(4), 813-827.
25. Trifkovic, M., Sheikhzadeh, M., Nigim, K., & Daoutidis, P. (2013). Modeling and control of a renewable hybrid energy system with hydrogen storage. *IEEE Transactions on Control Systems Technology*, 22(1), 169-179.
26. Mohsenzadeh, Y., Sheikhzadeh, H., Reza, A. M., Bathaee, N., & Kalayeh, M. M. (2013). The relevance sample-feature machine: A sparse Bayesian learning approach to joint feature-sample selection. *IEEE transactions on cybernetics*, 43(6), 2241-2254.