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## COMPARATIVE ANALYSIS OF THE METHODS FOR SELECTING INFRASTRUCTURE PROJECTS IN THE EUROPEAN UNION AND THE USA (WITH CONCLUSIONS FOR UZBEKISTAN)

**Abstract:** *the purpose of this article is to compare and analyze the methods and procedures for selecting infrastructure projects in the EU and the USA in order to suggest a framework that can be applied in Uzbekistan. There are few important infrastructure projects that were unsuccessful and one of the main reasons is the lack of the right methods of project selection in Uzbekistan. The article does the systematic analysis of the previous research to fulfill the goal of recommending the infrastructure selection method and the framework that can be applied in Uzbekistan.*

**Key words:** *infrastructure, project selection methods, project selection procedure, Social-Cost-Benefit-Analysis (SCBA), Multi-Criteria-Decision-Analysis (MCDA), Infrastructure Prioritization Framework (IPF), Uzbekistan.*

**Language:** *English*

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### Introduction

During the social-economic development of Uzbekistan, building and investing in infrastructure is one of the most important topics. There is a significant improvement in the number of infrastructure projects and investments in Uzbekistan, which in return brings social-economic development. Uzbekistan's Development Strategy for 2017-2021 mentions that the growth of infrastructure is the backbone for the development of the country [1]. The Development strategy focuses on the development of social, tourism, road, and transport, storage, production, engineering, energy communications infrastructure projects. As the demand for building more infrastructure rises so does the need for more successful projects that will be sustainable.

The world invests some \$2.5 trillion a year in infrastructure and this number must be at \$ 15 trillion by 2040 to supply the population and continue developing. Therefore, the current investment is not enough to meet the increasing need of the residents for modern infrastructure facilities. Consequently, improving project selection, project delivery, and management of current assets could cut the spending by 40% [2]. Even the most advanced economies have a considerable need to learn from each other and to shape stronger competencies and formulate the best project management methods. A diligent evaluation that benchmarks each aspect of infrastructure development against global best practices can find the areas where a clear-cut change could produce significant results. That's also true for Uzbekistan

<sup>1</sup> Adolat (2017). 2017 – the year of sweeping reforms. (pp. 21–39)  
T.: Adolat

<sup>2</sup> Woetzel, Mischke, Garemo, Hjerpe, & Palter, *Bridging global infrastructure gaps* 2016

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which could use such bench-marking for selection, delivery, and management of successful infrastructure projects.

The infrastructure projects usually cost a big amount of capital investment, the appropriate selection method for the infrastructure projects can support the investors and the government to prioritize and choose the projects that have a higher potential to be successful.

As there have been some cases in Uzbekistan where the projects have been approved and the infrastructure has been built but they have failed to be successful and sustainable. Such infrastructure projects will also damage the social-economic well-being of the residents in the area. One of the main reasons for such failure is the lack of reliable selection methods for infrastructure projects in Uzbekistan. The selection methods for such projects will influence the outcome of the project immensely. Thus, it is vital to analyze and apply the best practices used in the USA and the European Union and also learn from the drawbacks. Also, multiple projects are going on in the organization and they have a limited budget and have to sort out the projects that will bring significant benefits, and the project's objectives and organization's objectives are in line. **This signifies the importance** of comparative analysis of the methods for selecting infrastructure projects in the European Union and the USA so it can also be useful for Uzbekistan and contribute to the scientific and economic development of the country.

### The degree of elaboration of the problem

The issues of methods for the selection of effective infrastructure projects have been widely studied by foreign researchers. Theoretical, methodological, and practical aspects of the selection methods for infrastructure projects have been analyzed in the scientific works of foreign researchers C.C. Dutra, J.L.D. Ribeiro, M.M. de Carvalho [3], Seng Hansen, Eric Too, Tiendung Le<sup>4</sup>, S. Lindhard, S. Wandahl [5], Lifson, E.F. Shaifer [6], and others. However, no research has been found that is directly linked to the project selection methods by the Uzbek authors. Since it's a relatively new topic in the Uzbek research field, there is a significant gap for research.

However, in the available studies, insufficient attention has been paid to the issues of effectiveness of methods for the selection and prioritization of

infrastructure projects and there is a need for the development of appropriate criteria and methods that can be used in Uzbekistan. Besides, several projects are going on in the organization and they have a limited budget, time, and resources so they have to sort out the projects that will bring significant benefits, and the project's objectives and organization's objectives are in line with each other. The need to solve theoretical, methodological, and organizational problems of forming a system for choosing the effective methods for selecting infrastructure projects determined the choice of the topic of the thesis, the setting of goals, objectives, logic, and structure of the study.

### Literature review

**Infrastructure** is the fundamental systems and services, such as transport and power supplies, that a country or organization uses to function effectively [7], including the services and facilities necessary for its economy to work and prosper. Infrastructure includes buildings such as highways, railroads, bridges, tunnels, water supplies, sewers, electricity grids, and telecommunications. Infrastructure facilitates economic and social growth by offering services and transport to residents. Nowadays, more and more projects are being made and help the organization to achieve its strategic objectives. The terms 'project management' and 'project management maturity' are used widely in companies worldwide and recently they are also becoming trendy in Uzbekistan. The fast adoption of project management which is such a powerful tool has helped governments and companies to achieve their goals if that tool is used correctly. However, there have been many cases where this tool has been used incorrectly or was misapplied. According to several researchers [8], the speedy adoption of project management means:

- A lot of projects are not in line with the organization's main mission statement. For example, if providing affordable housing for the underprivileged is the main mission of the government's project but the project mentions the luxury materials and high-class design and more expensive amenities;
- Many projects are led but don't match the strategy and the goals of the organization;
- Many projects require excessive funding but their cost outweighs the benefit.

<sup>3</sup> C.C. Dutra, J.L.D. Ribeiro, M.M. de Carvalho, An economic-probabilistic model for project selection and prioritization, *Int. J. Proj. Manag* **32**, 1042 (2014)

<sup>4</sup> Hansen, Seng & Too, Eric & Le, Tiendung. (2019). Criteria to consider in selecting and prioritizing infrastructure projects. *MATEC Web of Conferences*. 270. 06004. 10.1051/mateconf/201927006004.

<sup>5</sup> S. Lindhard, S. Wandahl, Looking for Improvement in Last Planner System: Defining Selection Criteria, *ICCREM ASCE*, 27 (2013)

<sup>6</sup> Lifson, M. W., & Shaifer, E. F. (1982). *Decision and Risk Analysis for Construction Management*. JOHN WILEY & SONS, INC., 605 THIRD AVE., NEW YORK, NY 10158. 1982.

<sup>7</sup> Investopedia (2020) Infrastructure. Retrieved from <https://www.investopedia.com/terms/i/infrastructure.asp> on 20.08.2020

<sup>8</sup> Cleland and King, 1983, p. 155

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### Project selection procedure in the EU

To analyze the selection methodology and models used for selecting the infrastructure projects we will focus on Projects of Common Interest (PCI) in the energy sector of the European Union. As the European commission factsheet informs “Projects of common interest (PCIs) are key infrastructure projects, which will help the Member States to physically integrate their energy markets, allow them to diversify their energy sources and help put an end to the energy isolation that some of them are facing. They are the primary European tool to accelerate the deployment of the infrastructure necessary for the completion of the European energy market and to ensure that the European Union meets its goals of affordable, secure and sustainable energy” [9].

The main requirements to become a ‘project of common interest’:

- (1) Have a substantial impact on at minimum two EU Member Countries;
- (2) improve market assimilation and contribute to the incorporation of Member States' systems;
- (3) Upsurge competition on energy markets by giving alternatives to consumers;
- (4) boost the safety of supply;
- (5) Contribute to the EU energy and climate aims. The infrastructure object must integrate renewable energy sources.

### The funding organizations and their selection methods and models:

a) Connecting Europe Facility (CEF) Grants: the grants are aimed at constructure and research projects that need financial help. **Objective cost-benefit analysis (CBA) will be used to determine the recipient of the grants.**

b) CEF Financial instruments: All PCIs can apply. Unlike grants, the management of the funds to be assigned as EU financial funding will not be done via calls for proposals (**tenders**).

c) European Fund for Strategic Investment (EFSI): it is worth at least € 315 billion and all PCI projects and other projects can apply. The methods that are used in project selection are MCDM and CBA.

d) European Structural and Investment Funds: EU members can apply to get funding for the critical energy infrastructure projects so the Member States can get funding of approx. €2 billion to enormous infrastructure projects under the European Regional Development Fund (ERDF). The methods that are used in project selection are MCDM (MCDA) and CBA.

### Project selection procedure in the USA

To explain the project selection procedure, the guideline given by the Texas Department of Transportation (USA) has been taken. According to the Texas Department Of Transportation (USA), There are five typical steps in the project selection process: [10]

#### 1. Finding the need

Each undertaking begins with a thought or need. The catalyst for a task can emerge out of quite a few sources at the network, state, or government level. When a need has been recognized, venture allies ordinarily approach TxDOT's nearby office or their neighborhood Metropolitan Planning Organization (MPO).

#### 2. Financial Planning

From the get-go in the arranging cycle, the locale staff, and MPO staff when fitting, devise a subsidizing system for the proposed venture. The accessibility of financing is the main consideration in deciding if a venture is chosen.

#### 3. Planning

When a project is upheld at the neighborhood level, it contends with comparable ventures for subsidizing. Since ventures are frequently financed through a mix of subsidizing classes at an assortment of power levels, subsidizing can be a mind-boggling task.

#### 4. Project Development

Building a roadway, connect or other significant transportation improvement is an unpredictable, long haul measure that includes the cooperation of both transportation experts and the general population.

#### 5. Construction

Development contracts are granted through a serious offering measure, and the least qualified offer is submitted to the commission for endorsement. After the honor of the agreement, development starts. When an undertaking is completely in progress, development oversight and upkeep are refined at the TxDOT region and neighborhood level.

### Cost-Benefit Analysis of infrastructure projects

Maybe the most acknowledged strategy for Project assessment is Cost-Benefit Analysis (CBA). The handy improvement of Cost-Benefit Analysis began during the 1930s in the United States, generally for public speculation arranging at the government level, and has stayed a staple of the strategy of project selection [11]. This is to a great extent because CBA, while complex regarding inputs, is a genuinely clear idea, permitting examination of Projects dependent on a solitary measurement, adapted worth. CBA adds

<sup>9</sup>European commission (2015) Projects of common interest in energy - questions and answers.  
[https://ec.europa.eu/commission/presscorner/detail/en/MEMO\\_15\\_6108](https://ec.europa.eu/commission/presscorner/detail/en/MEMO_15_6108)

<sup>10</sup> Texas Department of Transportation (2013)  
[https://ftp.txdot.gov/pub/txdot-info/fin/utp/2013\\_psp.pdf](https://ftp.txdot.gov/pub/txdot-info/fin/utp/2013_psp.pdf)

<sup>11</sup> Zerbe and Bellas (2006), Cost-Benefit-Analsis. pp. 14-15

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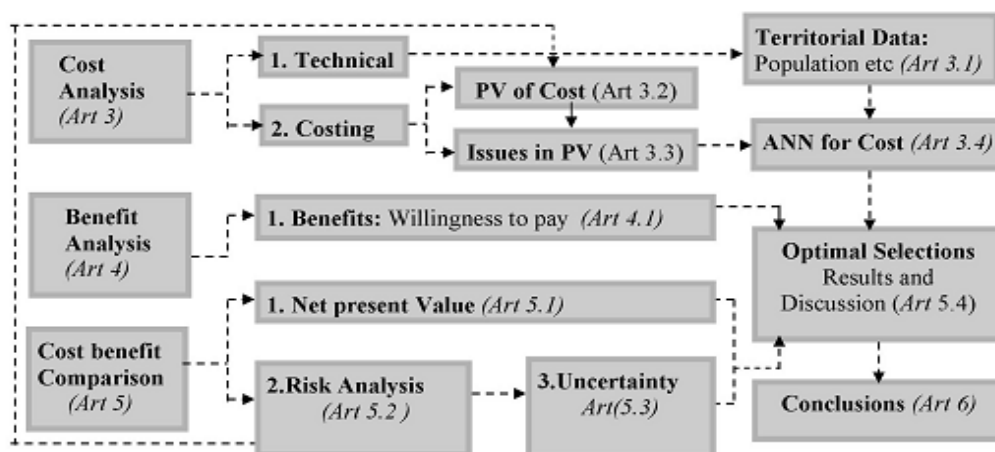
up to all expenses and advantages of an undertaking over its lifetime and limits future streams to compute Present Values. The (limited) Present Estimations of expenses and advantages are looked at, either by utilization of Net Present Value (positioning activities by most noteworthy NPV) or the Benefit-To-Cost Ratio (BCR) (used to reflect effective utilization of contributions for yields). A major guideline and key quality of CBA is that it permits leaders to naturally analyze different options dependent on a solitary marker, the venture's net worth [12].

CBA can be applied in conventional financial terms to the evaluation of alternative initiatives for a business, but it can also be expanded to the study of public spending by considering the full spectrum of (monetary and non-monetary) costs and benefits for the whole of society. In the Social Cost-Benefit Analysis (SCBA), prioritization is based on the selection of projects that optimize the net present values for society as a whole, without taking into

consideration the individual 'winners' and 'losers' of alternative projects.

Past these discussions, there are several pragmatic and specialized issues identified with the mechanics of CBA. To begin with, tending to theoretical elements and vital concerns is troublesome with CBA. Regular methodology to set up adapted qualities for a few non-promoted factors is not applied to all non-estimated impacts [13]. These issues uncover potential for positive thinking predisposition or cost underestimation [14] and show the gap in research and analysis.

A subsequent issue identifies with the choice of a suitable markdown rate. Numerous examinations expect a standard rate to be applied to a nation and area, which without a doubt reduces the weight of assurance. Be that as it may, it is likewise known that even slight adjustments in such pace of return can significantly affect determined advantage cost proportions and net present values [15].



**Figure 1. Cost-Benefit Analysis diagram.**

**Source:** Roy, K. & Thakur, B. & Konar, T. & Chakraborty, Shibnath. (2010). Rapid evaluation of water supply project feasibility in Kolkata, India. *Drinking-Water Engineering and Science*. 3. 10.5194/does-3-29-2010.

### Multi-Criteria Decision Analysis for infrastructure projects

Another arrangement of approaches that have picked up footing lately is the multicriteria examination. Writing investigation uncovers that numerous scientists utilize the Multiple Attribute Decision Making Methods (MADM) for venture choice. MADM likewise called Multi-Criteria

Decision-Making (MCDM) is the most notable part of dynamic. Multi-Criteria Decision Approaches/Methods (MCDA/M) expect to formalize the incorporation of non-financial as well as subjective variables into the choice investigation. Sometimes, basic multi-rules techniques might be valuable options in contrast to CBA when data issues are normal or expository assets restricted.

<sup>12</sup> Thomopoulos, Nikolas & Grant-Muller, SM & Tight, Miles. (2009). Incorporating equity considerations in transport infrastructure evaluation: Current practice and a proposed methodology. *Evaluation and program planning*. 32. 351-9. 10.1016/j.evalprogplan.2009.06.013.

<sup>13</sup> Dodgson, J & Spackman, Michael & Pearman, Alan & Phillips, Lawrence. (2009). *Multi-Criteria Analysis: A Manual*.

<sup>14</sup> Cantarelli, Chantal & Flyvbjerg, Bent & Wee, Bert & Molin, Eric. (2010). Lock-In and Its Influence on the Project Performance

of Large-Scale Transportation Infrastructure Projects: Investigating the Way in Which Lock-In Can Emerge and Affect Cost Overruns. *Environment and Planning B Planning and Design*. 37. 792-807. 10.1068/b36017.

<sup>15</sup> Ramani, Tara & Zietsman, Josias & Knowles, & Quadrifoglio, Luca. (2011). Sustainability Enhancement Tool for State DOTs Using Performance Measurement. *Journal of Transportation Engineering*. 404-415.



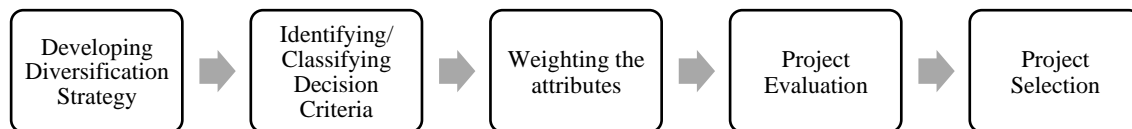
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In others, MCDMs are utilized to expand CBA. This turn in foundation advancement, furthermore, arranging is a reaction to worries about over-specialization, the possibility to downgrade basic social and ecological factors in CBA, the need to accommodate different framework related approach objectives, and viable restrictions on data.

Ravanshadnia, Rajaie, and Abbasian [16] apply MADM methods to propose an adapted model based on five steps to select the most appropriate candidate projects for bidding. The model is presented in Figure 2:

**Figure 2. Ambiguous MADM project selection**



Source: (adapted from Ravanshadnia, Rajaie & Abbasian, 2010, p. 1085)

### The Infrastructure Prioritization Framework

The alternative approach to project selection was suggested by David Marcelo et al. (2016) [17] and the framework was named as Infrastructure Prioritization Method.

The system has been developed by the World Bank and has been implemented in many developing countries. The Infrastructure Prioritization Framework (IPF) is a decision support tool designed to help policymakers prioritize investment in infrastructure under scarce resources, multiple policy priorities, and ambiguity [18]. The IPF is a foundation to extend choice dependent on more advanced and broad financial investigations, advancing governments from specially appointed or political determination to more precise methodologies. The Infrastructure Prioritization Framework reacts to interest for efficient foundation choice help that is plausible inside the asset methods for government and consolidates the key choices factors for an administration and a given area. IPF is a quantitative, multi-measures way to deal with assessing proposed ventures as indicated by government-chose social, ecological, money related, and financial models.

In-country discussions with Panama, Vietnam, Peru, and Indonesia, the researchers found that line agencies and local government units offered projects to the central government (such as the Ministry of Finance) in big numbers to get financing. The proposed projects had to go through pre-screening and basic assessment but they did not always go through complete SCBA (Social-Cost-Benefit-Analysis) or MCDA analysis.

The result of the studies on IPF shows that:

1. IPF can help improve the quality of existing data and their comparability
2. To prevent possible bias, methods and protective mechanisms should be used
3. For the effective use of IPF, it is necessary to build capacity
4. IPF works best when it is embedded in the planning of infrastructure projects

Therefore, Uzbekistan must take the necessary step to implement the IPF framework when the government bodies and private sponsors are deciding on selecting the infrastructure projects.

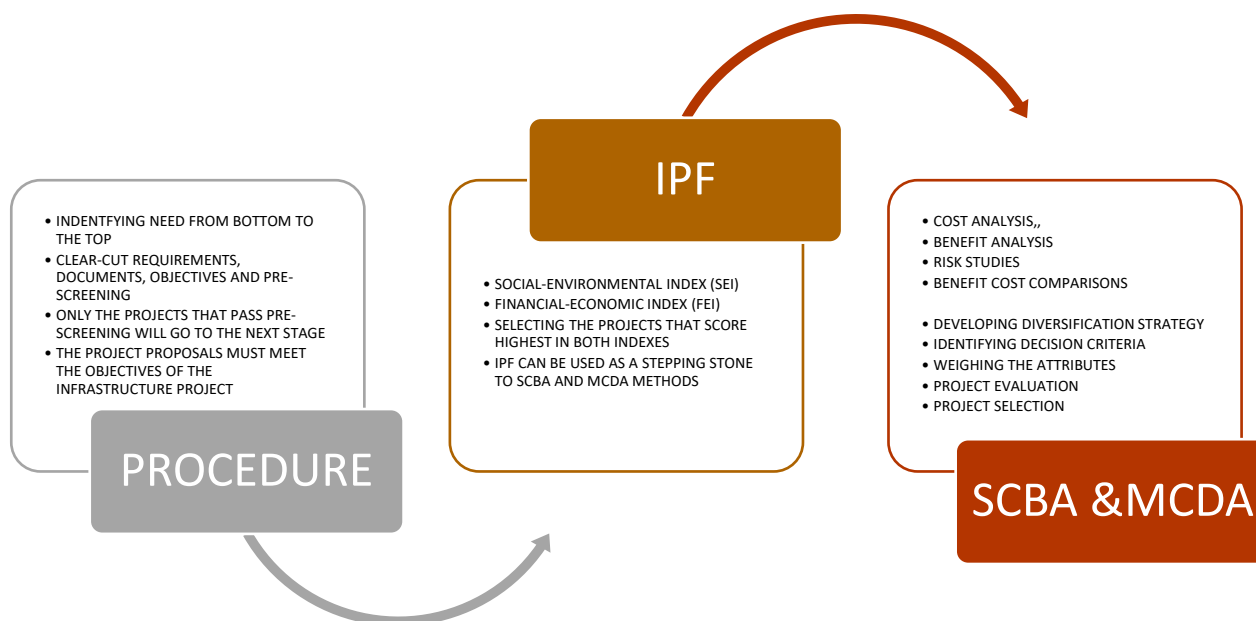
Thus, in this research, we suggest the framework which can be suitable for prioritizing and selecting the best infrastructure projects in Uzbekistan:

<sup>16</sup> Ravanshadnia, M., Rajaie, H. and Abbasian, H. (2010). Hybrid fuzzy MADM projectselection model for diversified construction companies. Canadian Journal of Civil Engineering, 37(8), pp.1082-1093.

<sup>18</sup> Darwin Marcelo, Cledan Mandri-Perrott, Schuyler House, Jordan Z. Schwartz World Bank PPP Group 14 April 2016. p 1.

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**Figure 3. Proposed project selection framework for Uzbekistan.**

From Figure 3 we can observe that firstly, the authorities and committees for infrastructure projects must focus on implementing the more effective procedure for participation and pre-screening of infrastructure projects. Instead of the top to bottom approach, it is more effective to have the bottom to top approach. Since the residents, local authorities, agencies, local specialists, and committees know more about the needs and requirements of the residents and the area. They could take an active part in identifying the need for infrastructure projects that will support both social and economic prosperity. The tenders need more transparency and clear-cut requirements, documents, the flow of selection procedure, and pre-screening. Pre-screening will help save time and resources and will support better decision making. After this stage, only the projects that meet the objectives of the project and the ones that are capable of delivering the project will be left. To continue these projects are evaluated using the IPF framework that is suitable to developing countries that lack the budget and have to choose among several projects. IPF can sort out the projects which have both high social-environmental index (SEI) and Financial-economic index (FEI) and it can be used as a stepping stone to

SCBA and MCDA methods. Before using the SCBA and MCDA methods which require more budget, specialists, data, and time, IPF could be implemented as an alternative in Uzbekistan. This in return will prioritize the infrastructure projects which are highly likely to succeed and be sustainable.

### Methodology

A systematic analysis of literature has been carried out in this research. In any discipline, the new research is based on previous knowledge so that it can offer new perspectives and findings. A literature review is widely described as a way of gathering and analyzing previous research.

A well-conducted literature review will help science and research to develop by providing new perspectives and bringing in new research frameworks [19] Some guidelines for conducting literature reviews suggest different types of reviews, such as narrative or integrative reviews [20].

A systematic literature review was conducted following the guidelines prescribed by Y. Le et al [21]

<sup>19</sup> Webster, Jane & Watson, Richard. (2002). Webster and Watson literature review. MIS Quarterly. 26.

<sup>20</sup> Pearson, M., Parkin, S. and Coomber, R. (2011). Generalizing Applied Qualitative Research on Harm Reduction: The Example

of a Public Injecting Typology. Contemporary Drug Problems, 38(1), pp.61-91.

<sup>21</sup> Y. Le, M. Shan, A.P.C. Chan, Y. Hu, Overview of Corruption Research in Construction, J. Manage. Eng 30(4), 02514001 (2014)

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and A.P.C. Chan et al [22] and Seng Hansen[23]. There are 5 steps in conducting the review and synthesis of the gathered data.

### Searching for literature sources

The search for literature on the topic considered all the sources available to be more inclusive of all the findings and research that was done by the foreign and local researchers, policymakers, and more.

### Selecting relevant literature

A pictorial examination was employed to go through articles and books. It was done by reading the abstracts and findings skimming the contents to identify important publications that are more associated with the research topic. A total of 30 publications were carefully chosen for further analysis.

### Analyzing the content

The thematic content investigation was carried out to synthesize the content of the selected publications and to extract the relevant selection models and methods. It is a common approach in analyzing qualitative data [24]. Here, the selected publications were analysed and grouped based on common themes. It involves the procedure of data familiarization which includes the double reading of documents, the data coding, as well as theme discussion and reassessment [25].

Table 1 below gives an example of the initial outcome of the coding process.

**Table 1. Example of the initial coding process**

Cost-benefit-analysis (CBA)	Quality-Based Selection (QBS)
Multi-Criteria Decision-Making (MCDM)	
Infrastructure Prioritization Framework (IPF)	
Analytic Hierarchy Process (AHP)	
Societal Cost-Benefit Analysis (SCBA)	

At this stage, there might be many criteria that intersect with one another from various works of literature. A subsequent coding process must then be carried out where all relevant details and initial coding have been checked. This process is important to ensure that the general concept of the data as well as

the relationships between them have been improved. In this case, certain codes have been changed and new codes have been added. An example of the updated codes from the subsequent coding process is shown in Table 2 below.

**Table 2. Example of the subsequent coding process.**

No	Selection method	Code
1	Cost-benefit-analysis	CBA
2	Infrastructure Prioritization Framework	IPF
3	Analytic Hierarchy Process	AHP
4	Societal Cost-Benefit Analysis	SCBA
5	Quality-Based Selection	QBS

After two coding processes, a synthesis of content analysis through an inductive process [26] was performed. The synthesis established the patterns, categories, and frameworks that answer the research question.

### Reporting the Findings

Finally, the findings and recommendations were discussed concerning the research question raised in this research.

### Conclusions and recommendations

It is imperative to identify the criteria for choosing the right selection method for the infrastructure as there are differences between policies, political and economic situations in each country. The method for selecting the infrastructure projects must be credible and flexible to meet the demands of the variety of project objectives. There is a strong need for the objectives of the stakeholders to be in line with the goals of the project delivery agency.

<sup>22</sup> A.P.C. Chan, E.K. Owusu, Corruption forms in the construction industry: literature review, *J. Constr. Eng. Manage* 143(8), 04017057 (2017)

<sup>23</sup> Hansen, Seng & Too, Eric & Le, Tiendung. (2019). Criteria to consider in selecting and prioritizing infrastructure projects. *MATEC Web of Conferences*. 270. 06004. 10.1051/mateconf/201927006004.

<sup>24</sup> Bryman, E. Bell, *Business Research Methods* 4th Edition (Oxford University Press, New York, 2015)

<sup>25</sup> V. Braun, V. Clarke, *Using Thematic Analysis in Psychology*, *Qual. Res. Psychol* 3(2), 77 (2006)

<sup>26</sup> E.Z.H. Zheng, M.M. de Carvalho, *Managing uncertainty in projects: a review, trends and gaps*, *GeP* 7(2), 95 (2016)

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Besides, it is vital to identify the need and the social and financial benefits that will be gained from the project. As the infrastructure project costs huge sums of capital, the proposed projects must go through pre-screening and a reliable method of selection that can weigh the potential benefits and risks. Rigorous screening of projects in the EU and the USA have supported the correct decision making and led to economic and social growth in the company.

However, there is still a gap for improvement in the selection methods of infrastructure projects in the EU and the USA, they have strong foundation and framework that performs well even there are many project proposals that need to be sorted out. Lastly, it's always important to benchmark and learn from the developed countries and these countries can also learn from the developing ones that have taken these methods and made them even better.

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<b>Impact Factor:</b>	<b>ISRA (India) = 4.971</b>	<b>SIS (USA) = 0.912</b>	<b>ICV (Poland) = 6.630</b>
	<b>ISI (Dubai, UAE) = 0.829</b>	<b>ПИИЦ (Russia) = 0.126</b>	<b>PIF (India) = 1.940</b>
	<b>GIF (Australia) = 0.564</b>	<b>ESJI (KZ) = 8.997</b>	<b>IBI (India) = 4.260</b>
	<b>JIF = 1.500</b>	<b>SJIF (Morocco) = 5.667</b>	<b>OAJI (USA) = 0.350</b>

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