

PAPER • OPEN ACCESS

Innovation of Analytical Software for Financing Construction Projects: Infrastructure Projects in Iraq as a Case Study

To cite this article: Saja Hadi Raheem and Faiq M.S. Al-Zwainy 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **978** 012015

View the [article online](#) for updates and enhancements.

You may also like

- [The Impact of Six Decades of Trauma on the Health of Iraqi People](#)
Hikmet J Jamil, Manhel R A Albahri, Nadia Al-Noor et al.
- [Cooling down roof mounted solar panels by optimizing the natural air movement around them](#)
Maryam D. Altaweel, H Alyasari and R Fawzi
- [Integrated solar thermal combined cycle for power generation in Iraq](#)
Khalidah A J Al-Qayim



The Electrochemical Society
Advancing solid state & electrochemical science & technology

242nd ECS Meeting

Oct 9 – 13, 2022 • Atlanta, GA, US

Abstract submission deadline: **April 8, 2022**

Connect. Engage. Champion. Empower. Accelerate.

MOVE SCIENCE FORWARD



Submit your abstract



Innovation of Analytical Software for Financing Construction Projects: Infrastructure Projects in Iraq as a Case Study

Saja Hadi Raheem^{1,*}  Faiq M. S. Al-Zwainy² 

¹ College of Engineering, University of Baghdad, Iraq

E-mail: s.rahim1001@coeng.uobaghdad.edu.iq

² College of Engineering, Al-Nahrain University, Iraq

E-mail: faiq.al-zwainy@eng.nahrainuniv.edu.iq

* Corresponding author: College of Engineering, University of Baghdad, Iraq. Tel: +9647717021830.

Abstract. This study includes application of an Analytical Software system to explain the financing methods applied in infrastructure projects in Iraq and highlight the importance of the tax in support the Iraqi economy by knowing the percentage of its contribution in supporting the financing of infrastructure projects. The proposed program is flexible, and easy to use. It enables the users adding and managing unlimited number of projects as well as any related information. The information obtained from this research can be used by the government policy maker and regulators and thus develop better understanding of the application and implementation of tax system in Iraq. It is concluded that the tax system leads to make tax revenues contribute to solving 70% of financing problems if applied in infrastructure projects, and therefore the contribution of government funding be 30%.

Keywords: Taxation, Financing, Infrastructure Projects, Computer Software.

1. Introduction

The tax system in any nation is the financial deanship. The tax system reflects all the tax laws and regulations that exist in it and these laws are often affected by the economic thinking of the state or the social system that prevails in the state, leading to a different tax system from one country to another, such factors affect the tax system from one culture to another (Oberlender Garold, 2000).

The tax system is a collection of taxes that the government imposes on citizens at a certain time, and is an effective tool in the state's hands to achieve the goals they want, however financial, political and social factors influence this process (Omidvar & Bordbar, 2013).

The most important component of the tax system is the legislative authority responsible for enforcing tax laws, as well as the administrative executive authority administering those laws and the judicial system responsible for settling disputes that may occur between taxpayers and the tax administration



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

while implementing those laws. The tax defined as a monetary duty paid by the individual to the State or one of its public bodies (Alavipour & Arditi, 2019).

The tax is also defined as a monetary amount to which the state is obliged to repay by individuals according to its ability to contribute with the state to bear the public burdens in order to achieve political, social and economic objectives within the state (Bird, 2011).

2. Types of taxes

Taxes are classified according to the method of taxation (Chase Bank, 2016);

- 1) Direct taxes: These are taxes that are imposed directly on income and capital and settle on the taxpayer and cannot transfer their burden, including taxes on profits and taxes on real estate sales.
- 2) Indirect taxes: A tax paid by the taxpayer and then transferred its burden to another person, it collected from the producer, exporter or importer in some way and its burden is ultimately on the consumer indirectly through high prices for goods produced or imported such as production tax, customs taxes and trading taxes such fees. Types of taxes are illustrated in figure 1 below:

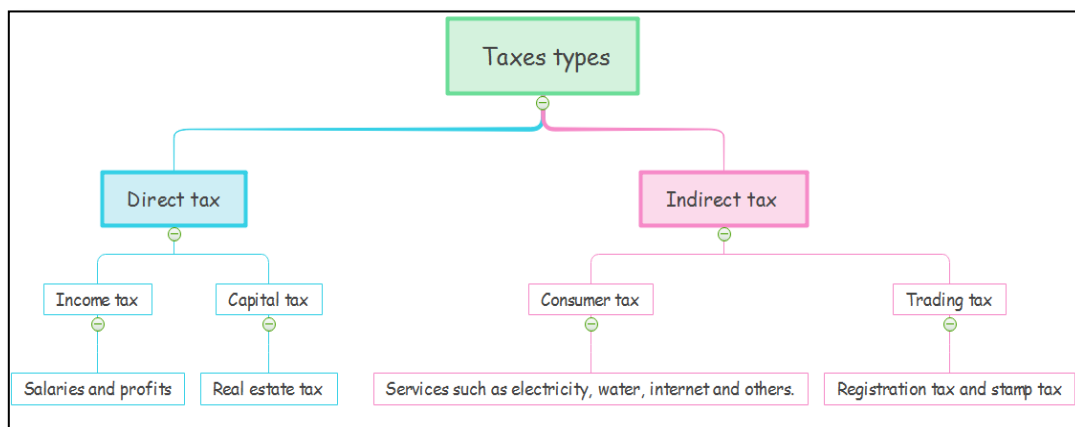


Figure 1. Types of taxes (Researcher based on Bird, Richard and Zolt, 2003)

2.1 Attributes of tax system

The tax system differs between growing and developed countries in terms of both the extent of reliance on taxes and the importance of taxes.

What concerns us here is the tax system in developing countries, as its economic system is the closest to Iraq's economic system, distinguished by the following characteristics:

- 1) A reduction in final tax revenue until it does not reach, on average, more than 15% of national income, while more than 30% of national income is reached in other developing countries. Perhaps the reason for the low tax revenue is due to the following:
 - a. Decreased national income from these countries due to inadequate growth in the production sector, which is reflected in lower individual income and a rise in the proportion of tax exemptions.
 - b. The autonomy of the agricultural sector, which in fact suffers from numerous problems over other productive sectors, ensures that it is not possible to impose taxes on this sector and therefore reduce the total tax revenue.
 - c. The restricted and primitive industrial sector, in addition to the influence of foreign companies, which receive significant tax exemptions to enable them to invest.
- 2) The tax system in these countries is characterized by an imbalance in which indirect taxes dominate, with a collection rate of 60%-80% of the general tax revenue.

- 3) Low significance of direct taxation, such as taxes on income and capital, due to low wages and widespread deprivation, and the lack of big investment projects that carry a significant proportion of the withholding tax.
- 4) The difficulty of tax collection and the prevalence of tax evasion due to the lack of advanced tax systems addressing tax evasion issues and the low efficiency of tax administration.

2.2 Types of taxes in the Iraqi tax system

Taxes in Iraq can be divided into two basic types (Cox & McLure, 2019):

- 1) Direct Tax: direct tax includes two varieties:
 - a. Income tax: It is the widest type of tax and is imposed on the largest segment of taxpayers engaged in various economic activities and generating annual revenue for them. This tax is regulated under Iraqi Income Tax Law No. 113 of 1982.
 - b. Real estate tax: It is the tax that is imposed on the total annual taxable income of his real estate income other than his residence, and its provisions are laid down in Real Estate Tax Act No. 162 of 1959.
- 2) Indirect Tax: includes several types;
 - a. Consumer tax: this type consists of:
 - *Customs taxes*: taxes levied on anything related to the flow of goods and services from or to the state or across borders. It is considered to be one of the most significant indirect taxes, because it levies large amounts of money on the state, and most developing countries depend on it for easy collection and increased resources. In Iraq, its provisions are governed by Iraqi Customs Tariff Law No. 77 of 1975, as amended, and the customs tax has been repealed and replaced by the Iraq Reconstruction Tax levied by CPA Order No. 28 of 2003. The previous two laws have been repealed and replaced by Customs Tariff Law No. 22 of 2010.
 - Taxes on production: these are taxes imposed on certain locally produced materials, and the state often uses exemptions for this tax, particularly in developing countries, to encourage national industries and compete with foreign products. This tax regulates the different laws. For example, the tax imposed on alcoholic beverages by Law No. 17 of 1973, the tax on cigarette production No. 64 of 1966 and the tax on oil production No. 9 of 1939 as revised.
 - b. Trade taxes: they are cash sums for the service provided by the State to the taxpayer and are divided into several types:
 - Tax on stamps: This tax is imposed on financial stamps affixed to the document relating to lawful. The rules of this tax are laid down in Stamping Law No. 16 of 1974. This tax is characterized by the optimistic economic condition of the Iraqi tax system.
 - Registration tax: In Iraq, they are referred to as registration fees and are charged while registering or documenting legal changes of property. Examples include tax on property registration and tax on vehicle registration. Its requirements are regulated by many laws, including the Law on Real Estate Registration No. 43 of 1971 and the Law on Judicial Fees No. 114 of 1981. This tax is considered to be small in price because it does not exceed 2% of the basic value of the transaction, as it is primarily concerned with the service rendered by the State to individuals.

3. Infrastructure projects

Usually an infrastructure is considered as the set of all the physical components which are needed to be build and operated to supply customers with a goods, e.g.: materials, energy, information, communication, etc. When the extension of these services involves a whole country, or a community of countries, the possible problems of an infrastructure may become problems for the country, or many countries (Cox & McLure, 2019).

Actually, an infrastructure is a complex organization structured in multilevel hierarchies. Its components must work and be operated in an integrated way. Examples of infrastructures are the electric power

system, cold chain, fuels supply, communications networks, transportation, social services, health care, military defense, etc. as illustrated in figure 2. Each infrastructure uses the services and the resources provided by other infrastructures and this can create the conditions for a mutual dependence. It is enough to think how many services today depend on electricity and telecommunications. Recently, this dependence increased quickly and it evolved into a strong interaction between the infrastructures. The mentioned blackout events showed how these interactions become critical and now it is usual to mention the main infrastructures as critical. The problem is already at economic and political levels. So, institutions started to consider, evaluate and plan the protection criteria for critical infrastructures and some reference definitions has been prepared (Cox & McLure, 2019) (Mohammed, Al-Zwainy, & Sameer, 2014).

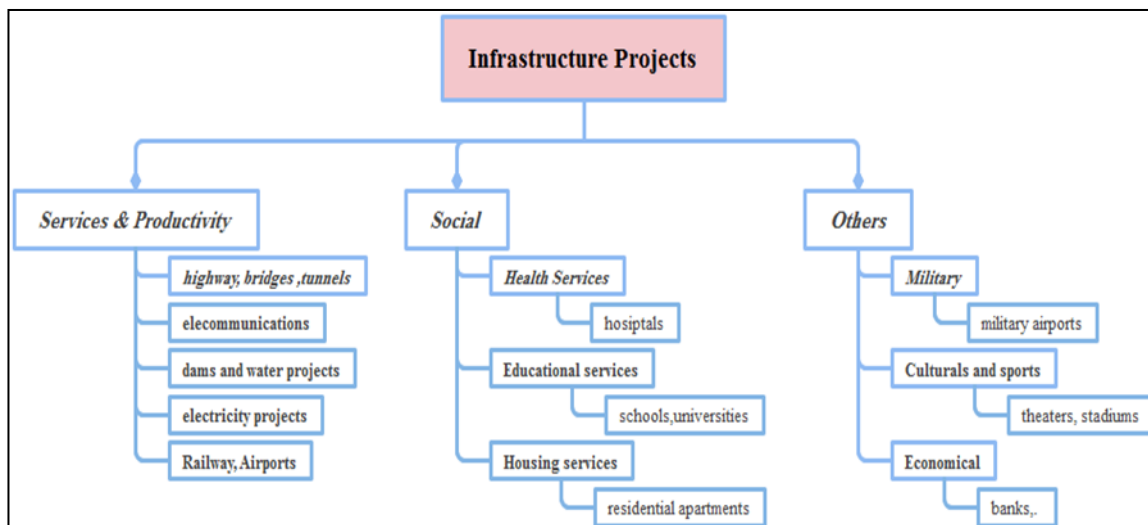


Figure 2. Infrastructure projects Types (Researcher)

3.1 Developing of the computer software

The main objective of this computer software was to introduction an active tax system, which also supports projects financing. This may be justified according to the following points;

- 1) The importance of such software is due to its high accuracy in tax system innovation since the recent error that has occurred by the use of such software is so small that it can be neglected.
- 2) The lack of effective documentation software in Iraq that can be used to recover the tax system innovation, using them to predict the requirements for financing in infrastructure projects.
- 3) The tax system affects the state revenues on the one hand and the money of citizens in the country on the other hand, as well as the national economy, especially with the adoption of financial and tax legislation to protect the national economy, and social through the issuance of tax legislation to protect public health or the environment.
- 4) Lack of the importance of direct taxes such as income and capital taxes, due to low incomes and the spread of poverty and the absence of large investment projects that bear a large proportion of tax deduction.
- 5) Difficult tax collection and the prevalence of tax evasion, due to the lack of sophisticated tax systems to treat the issues of tax evasion and low efficiency of tax administration.
- 6) There is no similar software currently in use by contractor construction companies or any other organization related to infrastructure projects in Iraq. All these authorities and organizations have agreed on the importance of the software as indicated by the questionnaire and personal interviews.
- 7) The infrastructure projects in Iraq still suffers from the lack of scientific software and expert for calculating accurate infrastructure estimated financing. The total financing estimation is important

in the bidding stage; therefore, the most popular reason for the failure to awarding construction contracts is the weakness in cost estimation process.

3.2 The Program specification

The system was designed and programmed using the following languages:

- 1) The programming language used for the design of the interface is HTML, CSS and JQuery.
- 2) The programming language used to analyze and connect databases and solve mathematical equations is PHP and JavaScript.
- 3) The database used is MySQL Server.
- 4) The local server that was used to open the program is Apache Server.
- 5) Responsive Web App technology has been used to simulate mobile devices, which ensures that the program can be run and used on any mobile device.

The system was programmed using Web Application technique; It ensures that the program can be run on an internal local network and that the program can be run on all devices connected to that internal network. The program can also be uploaded to a global network (Cloud). The program can be run anywhere in the world through an Internet service.

4. The Dialog of the computer program

The layout of the proposed tax system program is outlined in the flow chart as shown in figure3.

After installation of the system and pressing its icon the interface will appear, and consist of five options: *Case study, Start New Infrastructure Project, My Case Study, Information and Contact Information.*

Case study: previously created and stored in the system database.

When the user presses Case Study, the application is working, and the project case study window appears with three options: information about case study, show case study, and review of case study images. For *Show Case Study:* This window contains two options; *Overall View Flow Chart* and *Start Case Study.*

Overall View Flow Chart: Provides an outline of the flow chart that was prepared by the researcher, which reflects steps that demonstrate the methods of financing, including taxes, in order to know the magnitude of the tax contributions to the financing of infrastructure projects. Al-Nahrawan water treatment plant project is presented as a case study in this section.

Start Case Study: In this option, the information and data of the case study are entered and saved. as shown in Figure 4.

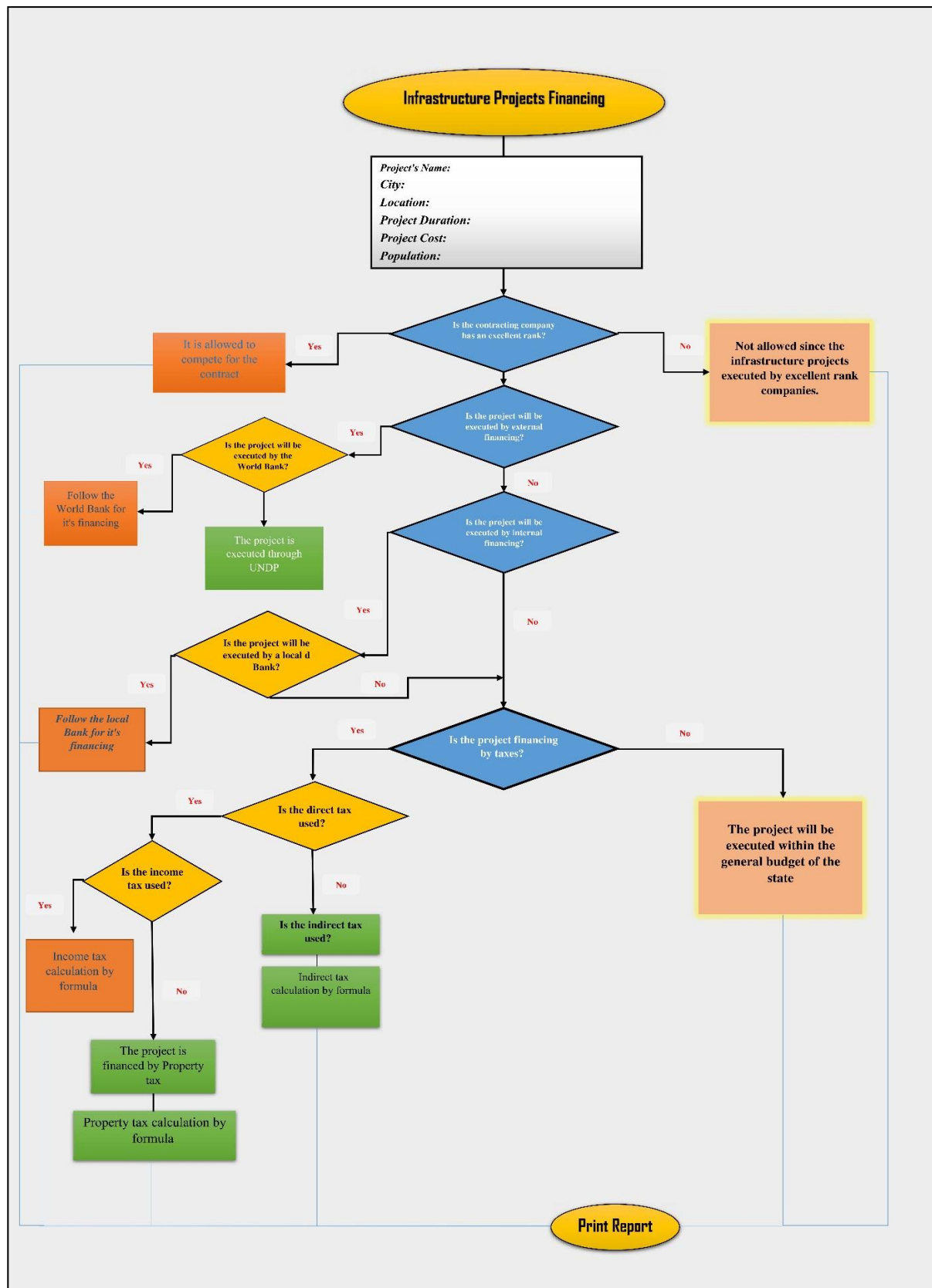


Figure 3. Flow-chart for Infrastructure Projects Finance

Project name	City	Location
Al-Nahrwan Water Treatment Plant	Baghdad	Al-Nahrwan City
Project duration	Project Cost	Population
2	200,000	82,810,506,791
	Years	Person
		ID

Figure 4. Screen of case study option

As shown in figure3 (flow chart steps), the researcher chooses the option No until the step of financing by taxes is reached, in order to know the contribution of taxes in financing the project.

5. Case study analysis result

The AL- Nahrawan water treatment plant project was analyzed to assess the magnitude of the tax contributions to the financing of infrastructure projects. The steps that were used to accomplish the financing through taxes. The information was collected and the percentage of the contribution in financing the project was found. The laws and conditions of living in Al- Nahrawan were taken into consideration, as were the rates of taxes that were imposed and applied in the city. The researcher was able to find information about the taxes applied in the city, which are, income tax, property tax and consumer tax. After entering the information as equations, the proportion of each type was calculated. After getting the result, the ratios and amounts available were compared with the remained, as shown in Table 1.

Table 1. Ratio of taxes contribution in financing (Researcher)

<i>Financing method by taxes</i>	<i>Available amount ID [1]</i>	<i>Projects cost ID [2]</i>	<i>Remained amount ID [2-1]</i>	<i>Ratio % [(2-1)/2]</i>
Income tax	28,800,000,000	82,810,506,791	54,610,506,791	66%
Property tax	5,000,000,000		77,810,506,791	94%
Consumer tax	25,200,000,000		57,610,506,791	69.5%
Total	59000000000	82,810,506,791	23,810,506,791	29%

From the Table 1, it was concluded that the contribution of taxes in financing the Al- Nahrawan water treatment plant was 71%, such that the tax system leads to make tax revenues contribute to solving 70% of financing problems, and therefore the contribution of government funding is 30%.

Start New Infrastructure Project: The user selects this option to create a new infrastructure project. The user must enter the data and information required to start the next step; all the required information is shown in Figure 5. The operation of the computer software is represented by the overall flow chart, which shows the logic that was used and the components of the software-user interface.

Figure 5. First window to start new infrastructure project

My Case Study: This option shows a new project that has been entered into the system and saved by the user.

Information: This option displays general information about the designer.

Contact us: This option allows Communication via e-mail.

6. Evaluation of the Proposed Program

The proposed program was presented to a group of experts for evaluating it, and in a style similar to the method used in the study of (Moatasem et al, 2018). The evaluation process had made by (10) experts, who have experience in construction management and in financial investment. The evaluation form distributed to individuals for obtain their opinion, comments, and recommendations about the operation and feasibility of proposed program. The questions related to evaluating the proposed program and the answers of respondents are summarized in Table 2.

The following sequences of steps were undertaken to complete the computer software evaluation interviews:

- 1) The evaluation documents were prepared to include a summary of the prepared software such as software dialog.
- 2) The prepared evaluation documents were handed over to the selected concerned people with a general overall preliminary presentation of its contents.
- 3) Sufficient time period was allowed to study these documents.
- 4) A prepared sort of questionnaire form Table2 was filled for each evaluation characteristics or questions.
- 5) Five answers as choices (Very Low, Low, Medium, High, Very High) were given.
- 6) Selection of the appropriate answer choice was left up to the satisfaction of the concerned person for estimation.
- 7) Upon completion of the interview, evaluation replies were personally collected.

Table 2. The Respondents' Answers on the Questions Related to Program Evaluation

No	Questions	V. Low (1)	Low (2)	Medium (3)	High (4)	V. High (5)	A.M	Rating level
1	What is your opinion about the assistance provided by the proposed program to the project manager to manage and implement the infrastructure project?	0	0	0	3	7	4.7	V. High
2	What do you think about the effectiveness of the proposed program at the project funding?	0	1	2	5	2	3.8	High
3	What do you think about the importance of the proposed program for your workplace?	0	0	3	5	2	3.9	High
5	How easily is use of the proposed program by the users?	0	0	0	2	8	4.8	V. High
6	What extent the proposed program has achieved its purpose and applicable?	0	0	1	5	4	4.3	V. High
7	What is your opinion about the accuracy of the information provided by the proposed system?	0	0	2	3	5	4.3	V. High
8	What is the effect of the proposed program in developing process of managing the construction projects?	0	0	2	5	3	4.1	V. High

The results indicate that the proposed development of the computer software is acceptable and can achieve the required financing of infrastructure projects. This indicates that the proposed software is efficient and complete and it can be used with more effectiveness if the decision-making authorities support it.

7. Conclusions

This study includes the application of an Analytical Software system to explain the financing methods applied in infrastructure projects in Iraq and highlight the importance of taxes in supporting the Iraqi economy, by finding the percentage of its contribution to the financing of infrastructure projects. The proposed program enables the users to add and manage an unlimited number of projects and any related information. The information obtained from this research can be used by government policy makers and regulators to develop better understanding of the application and the implementation of the tax system in Iraq. The study concludes that the tax system leads to make tax revenues contribute to solving 70% of financing problems if applied in infrastructure projects, and therefore the contribution of government funding would be 30%.

Acknowledgements

Authors would like to thank those respected persons who have helped and guided us to achieve this paper; they really deserve all respect and gratitude. We also want to thank and give our gratitude to everyone who has guided or advised us in submitting or writing this paper.

Author Contributions

Saja H. Al-Dhamad developed the Program System, wrote the manuscript and performed the computations; Faiq M. S. Al-Zwainy devised the project, the main conceptual ideas and proof outline and worked out almost all of the technical details, proposed the Analytical Software and involved in planning and supervised the current study. All authors discussed the results and contributed to the final manuscript.

References

- [1] Alavipour, S. M. R., & Arditi, D. (2019). Maximizing expected contractor profit using an integrated model. *Engineering, Construction and Architectural Management*, 26(1), 118–138. <https://doi.org/10.1108/ECAM-04-2018-0149>.
- [2] Bird, R. M. (2011). Tax Challenges Facing Developing Countries: A Perspective from Outside the Policy Arena. *SSRN Electronic Journal*, (November). <https://doi.org/10.2139/ssrn.1393991>.
- [3] Cox, M., & McLure, C. (2019). Taxation. *Encyclopædia Britannica, Inc.* Retrieved from <https://www.britannica.com/topic/taxation>.
- [4] Mohammed, I. A., Al-Zwainy, F. M. S., & Sameer, D. (2014). INTERNATIONAL. *INTERNATIONAL JOURNAL OF CIVIL ENGINEERING AND TECHNOLOGY (IJCIET)*, 5(9), 145–155.
- [5] Oberlender Garold, D. (2000). *PROJECT MANAGEMENT FOR ENGINEERING AND CONSTRUCTION" McGraw-Hill Higher Education*.
- [6] Omidvar, M., & Bordbar, F. (2013). *Advanced decision support systems for managers*. 2(3), 700–708.
- [7] Moatasem I. A., Ibrahim A. Mohammed, Faiq M. S. AL-Zwainy, Huda F. Ibraheem, 2018. Development of an Analytical Software for Cost Estimation for Highway Project, *International Journal of Applied Engineering Research*, 13(9), 6944-6951.