

-RESEARCH ARTICLE-

EVALUATING INVESTMENT FINANCIAL PROJECTS USING ARTIFICIAL NEURAL NETWORKS: APPLIED RESEARCH IN THE MINISTRY OF SCIENCE AND TECHNOLOGY

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—Abstract—

The current research aims at examining the effectiveness index as an approach towards investment project appraisal, paying special attention to such an instrument of financial management as Neural Networks (NN). It aims at identifying the extent to which the effectiveness index and NN could help the Iraqi Ministry of Science and Technology in the process of evaluating investment projects in different industries. Among other aspects, this research also focuses on the main issues related to using the effectiveness index for decision making and the possibility of applying NN methods in public investment appraisal. It should be noted that one of the basic assumptions of this research is that the combined use of the effectiveness index and NN contributes to the improvement of investment projects evaluation. Based on the results of interview and analytical studies, it was found out that the effectiveness index reflects the degree of achievement of project goals accurately while NN demonstrates high operational efficiency being able to predict events with up to 98% of probability in case of incomplete data.

Keywords: Effectiveness Index, Project Objectives, Projects Investment Evaluation, Making Decisions, Artificial Neural Network.

INTRODUCTION

This study centres on the concept of effectiveness, which is generally understood as “doing the right things”, meaning that organisational actors direct their efforts towards appropriate objectives that contribute to overall strategic growth (Mutambo et al.,

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2022). Prior to engaging in any evaluation framework, it is essential to first clarify the meaning of effectiveness. In operational terms, effectiveness refers to the extent to which predefined objectives are achieved. Accordingly, the effectiveness index is defined as the measurable degree of objective attainment (Rivaldo & Nabella, 2023). In practical terms, it represents the proportion between achieved outcomes and originally planned targets.

Within the domain of investment management, effective processes are shaped by a combination of multidimensional and interrelated organisational activities involved in company formation and development (Sobieraj & Metelski, 2023). These processes are known by their capacity to meet the goals set forth by the investment projects (Kahdim et al., 2025). This indicates the general level of success in achieving the goals set forth. If the attention of managers is focused on setting goals for organisations and achieving them, then effectiveness becomes one of the important criteria of assessing performance (Aguilera et al., 2024). Thus, in this case, project evaluation is one of the basic tools that allows determining whether investment projects are successful. (Bolun & Ghetmancenco, 2022).

In summary, the current study thus intends to ascertain whether the viability of an enterprise or a project can be determined and evaluated effectively (Wamba-Taguimdje et al., 2020), and at the same time, consider the feasibility and applicability of using Artificial NN as advanced computing techniques for aiding the evaluation process. Evaluation of projects gives a prediction of how successful the financial investments made will turn out since they consider how well the goals set have been met. In most cases, it has been recognized as one of the major processes involved in achieving success of a project or maximizing the investments made. (Volden & Welde, 2022).

As far as project managers and organisational leaders are concerned, their success greatly depends on the implementation of proper strategies and utilisation of technologies. Nevertheless, evaluating project success is a complicated process due to the presence of various dependent factors that vary from one context or project to another (Glyptis et al., 2020). As for industrial development, investment projects serve as primary tools that help make decisions according to commercial, technical, environmental, economic, financial, and social criteria (Ampatzoglou et al., 2021). The process of defining the scope of assessment should include active participation of relevant stakeholders as well as identification of parameters. Managers are expected to set clear goals to facilitate a systematic evaluation process. Project evaluation approaches are also employed in non-profit and governmental organisations to facilitate systematic assessment. In the case of investment contexts filled with uncertainty, projects can be modelled using uncertain numerical estimations, which allows creating optimal investment portfolios through probability analysis (Karimi et al., 2022). The traditional approaches of evaluating projects' value, such as Net

Present Value (NPV) and Internal Rate of Return (IRR), are still widely utilised in situations of financial uncertainty (Czipf, 2025; Wangchuk, 2022).

In addition to financial assessment, projects can be planned to take advantage of organisational capabilities for achieving strategic goals, such as reviving corporate strategies at large. Organisational structures based on projects are characterised by increased flexibility, shared managerial accountability, organisational development, and environmental adaptability (Sun et al., 2022). This is why the definition of project evaluation implies a structured procedure of gathering and using information to evaluate project effectiveness and efficiency (Haass & Guzman, 2020). Thus, the concept of investment efficiency refers to how well project goals match stakeholders' interests in the investment environment (Shiferaw, 2024).

In recent advancements, the use of AI algorithms, specifically feedback neural networks, have become common in various fields such as economics, finance, medicine, and sport sciences (Abdolrasol et al., 2021; Yalcin & Alisawi, 2026). Neural network algorithms imitate certain features of the human nervous system by being made up of input units that interact with external stimulus (Wang et al., 2023). The process of stimulation dictates if the stimuli are sufficient enough to elicit a response from the neurons, whereas the output stage yields predictions or evaluations through the processing of certain variables (Han et al., 2022). Through improved neural architectures, the inclusion of output feedback as part of the input units helps to increase efficiency. From an implementation perspective, project evaluation typically involves sequential stages, including funding acquisition, feasibility analysis, execution planning, and efficiency assessment (Shayan et al., 2022). In Iraq, the Ministry of Planning plays a central role in evaluating public investment projects and reviewing feasibility studies before approving funding allocations (Mohsin et al., 2020). Once funded, the projects become part of the national investment program. Monitoring and evaluation tend to be related processes, since project implementation monitoring can be seen as project evaluation (Güemes et al., 2020).

Characteristics of investments also vary widely depending on the sector, whether commercial or agricultural industries, as a result of differences in nature of projects (Bosman et al., 2020). The current evaluation models have moved from just maximizing profits to creation of values for society. The success of projects will mainly depend on effective project operation management, not only by contractors, owners, and consultants, but also their balancing of cost, time, and quality in line with project goals (Mathar et al., 2020). Modern evaluation models incorporate advanced indicator system integrating quantitative, qualitative and risk based indicators to evaluate performance of investments (Isai et al., 2021). Moreover, project management skills are not only required at individual level, but also at team and organizational level, especially in project-based organizations. Competencies in project management should be harmonized at all levels, ranging from project owners,

managers to team members in line with organizational project management competency frameworks (Ghorbani, 2023).

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This chapter reviews the implementation of the Effectiveness Index and NN models in the analysis of investments in various industries under the jurisdiction of the Ministry of Science and Technology in Iraq. This review is based on numerous research that are related to investment appraisal, decision-making, and efficiency assessment. Lamprou and Vagiona (2022) propose an analytical framework for evaluating projects by introducing criteria for assessing the success of project implementation. This paper proposes a new methodology that improves the effectiveness of measuring project success. Haidari (2023) concentrates on the process of making investment decisions. The paper specifically evaluates the issue of economic efficiency in making investment decisions. Analytical instruments are employed to measure the precision of demand forecasting, and sensitivity analysis is used to detect critical factors of financial risks.

Chubarkina (2020) Highlights the significance of qualitative factors in assessing the implementation of strategy in regional development systems. The findings reveal that although the implementation of a control system may prove to be effective, the assessment should necessarily include the consideration of the cost factor and indicators of investment performance. Ni (2021) explores approaches to assessing the effectiveness of investments and outlines stages of project development in the sphere of investments. The author employs the experience of developed countries based on the concept of the time value of money, stressing the importance of a structured financial approach to new spheres.

In their research, Zhong and Wu (2020) consider the issue of investment decision making through the combination of cost-effectiveness analysis, risk appraisal, and financial tools. The researchers consider both non-discounted approaches (PB, ARR, BEP) and discounted approaches (NPV, IRR, DPB) and concluded that the sustainability of financial results and liquidity are crucial factors in making strategic investment decisions. Zhang et al. (2022) offer the integrated approach to financial modeling that takes into account asymmetric perception of the project and multidimensional risks. The authors' results show that the combination of conventional discounted cash flow approaches and more sophisticated risk and sensitivity analysis makes the investment evaluation models more accurate and robust. The paper by, Li and Gan (2025) considers the issue of investment effectiveness in the new energy vehicles projects at SAIC Motor Corp. Ltd. (2014–2018). The researchers' work is based on cash flow evaluation and some financial indicators (NPV and IRR).

Petryna et al. (2020) present a methodology for assessing investment projects taking into account risk conditions. In contrast to previous studies, their methodology takes into consideration the cause-and-effect relationship between the risk factors, thus increasing the validity of economic viability assessments. Their conclusions draw attention to the complexity of the return-risk trade-off in investment decisions. Karlibaeva et al. (2022) analyse the efficiency of investment projects with respect to innovation activities and strategic objectives of enterprises. The conclusions of the study stress the significance of identifying and utilising internal resources in time to increase the innovative performance and organisational efficiency. Wangchuk (2022) presents a comparative analysis of NPV and IRR methods and discusses their advantages and disadvantages. The author calls for more comparative analysis of NPV, IRR and MIRR. Picciotto (2020) the focus of the paper is on project management methodology with regard to the creation of clear objectives through well-structured business cases. As such, the conclusion of the study suggests that well-defined objectives are crucial for the success of the project, and sufficient time should be devoted to ensuring the accuracy of objectives and their consistency with the strategic goals of the organization. In combination, these papers indicate that the evaluation of investment projects is a complex task involving financial modeling, risk assessment, qualitative factors, and decision support systems. In this regard, the use of the Effectiveness Index together with NN analysis systems represents a higher level of evaluation of investment projects.

Considering the results of previous studies, the problem of investment project evaluation in terms of achieving its goals can be defined by means of the following main question: what is the role of the effectiveness index in investment project evaluation? Given that the effectiveness index indicates how well the objectives of the investment project are achieved, the key challenge faced by project managers from the Ministry of Science and Technology is how to use this index efficiently. Moreover, the question arises whether artificial intelligence technologies and NN analysis can be used for financial investment projects. Hypothesis statement: "The study uses the Effectiveness Index and NN method to support the evaluation of Investment Projects of the Ministry of Science and Technology in Iraq."

METHODOLOGY

The Collection of Data

The sample used in this study involved the selection of some investment projects in the Ministry of Science and Technology, particularly those involving project leaders in charge of such projects. In this case, 30 investment projects were selected as part of the sample, whereby each project was made up of an overall objective along with sub-objectives. Moreover, the employees from the planning department of the Ministry were also chosen as part of the sample. Data collection lasted for a period of two

months, while the total duration of the research lasted between the years 2020-2023. The data collected involved descriptive data about each project and included the following:

- Project name
- Project location
- Construction period and expected year of operation
- Project owners
- Project objectives

All such data related to the project represent the information that should be provided in this case. As for the public investment projects in Iraq, a standardized form to be prepared by the Ministry of Planning shall include all necessary data. Such form includes a feasibility study that is carried out by the owners of the project for each respective project. After being completed, this feasibility study should be provided to all ministries and governmental bodies, including the research sample chosen for the current study, i.e. the Ministry of Science and Technology.

Research Model of Framework

The study relies on the quantitative methodology for investigating the effectiveness index and the application of the indicator for the evaluation of investment projects. This study also adds knowledge by providing a theoretical and applied consideration of one of the important financial management tools in evaluating investment projects, which is NN. There are several reasons why such an approach can be justified. Firstly, the quantitative methodology allows conducting an objective investigation of the issue under discussion based on measurable and verifiable data. Secondly, the research is aimed at analyzing the effectiveness index as a part of the evaluation of investment projects. Thus, this is the most appropriate way of conducting the study. Thirdly, the analysis covers NN as a financial indicator in evaluating investment projects.

Research Tools and Model

The effectiveness index was applied as one of the financial indicators for evaluating investment projects. As for the assessment of the investment project's ability to achieve the set objectives, it could be considered according to the SMART criteria (i.e. specific, measurable, achievable, realistic, and time-bound). Moreover, a multi-stage feedback neural network algorithm was applied within the context of the study. The data set consisted of two groups: the first group, called the system learning group, included 20 investment projects for the model training; the second group, called the system testing group, included 10 projects for system evaluation and validation.

$$\text{Effectiveness} = (-- * 25\%) + (-- * 50\%) + (-- * 75\%) + (-- * 100\%).$$

The results indicate that the input variables for each project consist of the weights assigned to the sub-objectives, as well as their respective completion rates.

- A linear regression equation was calculated for the values according to the equation ($Y=ax+b$).

The results were as follows:

- Sample size: 30
- Mean x (\bar{x}): Mean y (\bar{y}): Intercept (a): Slope (b):
- Regression line equation: $y=9.46-0.09x$

RESULTS AND DISCUSSION

Based on the extent to which projects achieve their defined objectives, success will be assessed and the corresponding evaluation criteria and performance indicators for project outcomes will be established. Effective performance indicators include user satisfaction, efficiency, effectiveness, and continuous project monitoring. The attainment of investment project objectives is also linked to the application of SMART criteria, where objectives are defined as specific, measurable, achievable, realistic, and time bound. In this section, projects are classified according to the Ministry of Planning guideline issued in 2008, which distinguishes between quantifiable and non-quantifiable projects. Furthermore, decision-makers at senior organisational levels are monitored to assess the degree to which investment objectives and outcomes of project owners within the Ministry are being achieved (Table 1).

The study utilised 30 investment projects, each consisting of one main objective alongside a set of sub-objectives. A specific weight was assigned to each main and sub-objective, in addition to determining their respective percentage of completion. Based on the completion rates and assigned weights of the sub-objectives, the final overall completion percentage for each project was calculated. A NN algorithm was then implemented, which received these inputs—namely the completion percentages of objectives and their corresponding weights—and processed them to predict the final project completion percentage through computational modelling.

Table 1: The Objectives and Data for the Investment Projects

No	Name of the Project & the Objectives of Project	Period
1	Manufacturing of the Tooth Rebuilding Material -Conduct research and scientific tests to determine the conditions of manufacture dental restoration	9
2	Industrial Purification of the Iraqi Soil -Limitation of the herbal oils as per great need for that and with the economic quantities.	9
3	Supervisory Control Systems and the Collection of Information SCADA -Prepare and equip the laboratories (SCADA development)	5

4	Establishment of Special Laboratory in the Studies of Development Nanomaterial -To establish a material and advanced scientific base to produce and diagnose the Nano materials with different industrial and medical uses and that is to upgrade the fields to serve inclusive develop	5
5	Establishing the Materialism Base of the Iraqi Wind Energy Project -The project aims to prepare the proper infrastructure for the wind power activities in the department of Renewable Energy Technology Researches, and the same way the establishment of the capacities for partners associated to it and to update them in terms of education and practice	6
6	Building Material Base for Laboratories Solar Thermal- Project Hybrid Power (In Shihabi) -Research Laboratory engines solar energy.	7
7	Generation Station to Receive Satellite Images -To build a ground station to receive national daily satellite images of the satellites for the sensitization and remote	7
8	Electronic Ministry -Minimizing and providing several efforts and time and the money utilized in the government deals and that is through replacing the traditional paper calls management with electronic ones.	7
9	Fish Breeding and Propagation Technique using Floating Cages in Iraq -Raise the level of fish production locally in line with the increase in population.	6
10	Development Laboratories Bacteriological Examinations of Water using Modern Technologies -The development of scientific personnel in the field of technology microbe assigned researchers returning to the ministry and outside researchers and graduate students	4
11	Design and Construction of the Pilot System for Treatment of Soil -The project aims at standardizing and study the conditions of the dismantling of waste oil at level of the lead, as it is made up of the system leading from the digester or fermented capacity (13:00 3)	4
12	Establishing a Laboratory for Natural Isotopes Analysis in Water -The project aims to create a specialized laboratories in measurements of isotopes stable environmental such as 18O and 2H and radioactive such as 3H and 14C using specialized equipment such as a mass spectrometer isotopic (IRMS) and device analyst isotopic water Liquid Water Isotope Analyzer and a counter pulsed liquid LSC In addition to the systems enrichment (Enriching) own system, which includes enrichment of tritium (3H) system and the preparation of gasoline (14C)	6
13	Building of the Wind Tunnel for Quick Subsonic -To conduct procedural exercises and tests for the primary and high-level researches and studies.	4
14	Human Capacity Development Project -Development potential in the field of information technology to increase production and improve competitiveness.	6
15	Preparation of Periodic Maps Desertification -The project aims to monitor and assess desertification in Iraq and the production of maps on a regular basis and the fact that continuous long-term phenomenon.	4
16	Use of Geophysical Techniques to Discover the Ground Water in the Selected Sites in Middle and South -Building material base of geophysical services specialized in the detection of groundwater and buy wheels field.	5
17	Developing and Synthesis of Vaccine Sticky Nitrogen and Bio-Pesticide to Increase the Production of Economic Crops -This work aims to establish a processing laboratory for the completion of scientific research that leads to the synthesis product is effective in nitrogen fixation and protect the roots of the causes of plant pathogens and applied it.	3

18	Using of Modern Technologies for the Rapid Production of High-Ranking Seed Potato -To overcome some of the problems suffered by investors in the provision of seeds sound expensive and overcome the problems of the methods used in the production of the higher ranks of the seed potatoes	4
19	Technical Applications of Magnetic Systems (Locally Manufactured) in the Treatment of Water for Agricultural Purposes - Field of application of agricultural and drought conditions taking place in the country and high rates of salinity. Compared with other techniques, it does not need regular maintenance or use any kind of chemical additives that lead to the emergence of environmentally harmful waste	5
20	Research of Accompanying Water Systems for Oil Extraction -To build a data base for the pollutant of the accompanying waters for the oil extraction and especially in the oil fields.	6
21	Technical Applications of Magnetic Systems (Locally Manufactured) in the Treatment of Water for Irrigation -The project aims to transfer and settlement and development of the technology and its application in magnetic fields of agriculture, industry and the environment as one of the eco-friendly technologies and inexpensive, especially in the field of application of drought conditions taking place	5
22	Supervisory Control Systems and the Collection of Information SCADA -Prepare and equip the laboratories (telemetry) estimated the duration of one year with a staff coach f	6
23	Generation Station to Receive Satellite Images -To build a ground station to receive national daily satellite images of the satellites for the sensitization and remote	7
24	Building Material Base for Laboratories Solar Thermal -Research Laboratory axis solar tracking systems, one with double.	4
25	Capacity and Infrastructure Development Project -The deployment of information technology applications and use through the development of competencies and resources, networking, and knowledge base, and infrastructure.	5
26	Changes Historical Time with the Help of Satellite Images - Follow-up phenomenon and are evaluated using modern satellite images and conduct field surveys in different periods of time and continuously to produce	5
27	Other materials contaminated with oil derivatives and production of biogas as a by-product the treatment of soils contaminated with oil derivatives and using the revival of microscopic local (pass the nutrients simple help the growth of microorganisms)	4
28	Establishment of the Wind Tunnel for Quick Subsonic -Establishment of a material base to build the central wind tunnel to conduct the aero dynamic checks	4
29	Research and Development of Accompanying Water Systems for Oil Extraction -To build a data base for the pollutant of the accompanying waters for the oil extraction and especially in the oil fields.	6
30	Development of Accompanying Water Systems for Oil Extraction -Build a wide pioneering system 0.5m ³ hours to treat these waters and to extract the designing data with which we can build bigger units	5

The Results of the System

- Sample Size: 30
- Mean \bar{x} : 82.38

- Mean y (\bar{y}): 2.36
- Intercept (a): 9.46
- Slope (b): -0.09
- Regression Line Equation: $y=9.46-0.09x$
- System Operation Procedures

The data of (30 projects) was separated into two groups:

- The First Group: the system learning group, which includes (20) projects.
- The Second Group: the system testing group, which includes (10) projects.

The results are the input variables for each project, which are the weights of the sub-goals and their completion rate. A linear regression equation was calculated for the values according to the equation

$$Y=ax+b$$

The results were as follows:

- Sample Size: 30
- Mean x (\bar{x}): 82.38
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- Intercept (a): 9.46
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- Regression Line Equation: $y=9.46-0.09x$

Figure (1) shows the linear regression for the projects: Where:

Y = Final completion rate

X = Input variables for each project, which are the weights of the sub-goals and their completion rate.

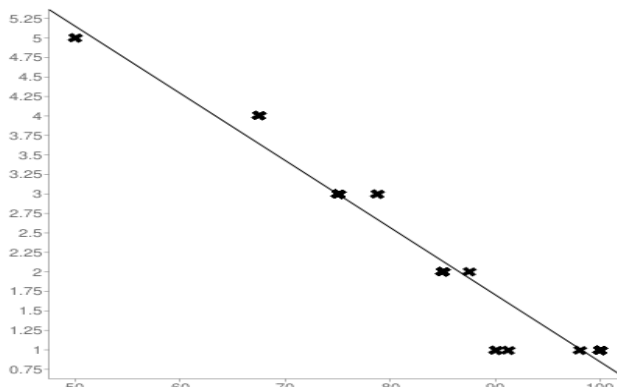


Figure 1: X = Input Variables for Each Project, Which are the Weights Sub-Goals and their Achievement Rate

Based on the results in the above point, a system was proposed and tested that uses artificial neural networks to predict the final completion rates for each project (in the system learning group, this data was used to learn the proposed system based on the data pattern, and in the system testing group, the system's efficiency and accuracy in predicting the required values were examined and tested). That is, the weights of the sub-goals for each project were tested along with the final completion rate in the learning process, while the weights of the sub-goals and their completion rates were used to obtain final completion rates.

The Proposed System Consists of Three Stages

The Input Stage

In this stage, the number of input cells required to supply the system with data is defined, with each cell representing a single value (where each input cell corresponds to one sub-goal). Accordingly, the number of inputs is determined by the number of sub-goals, which in the present system is fixed at five cells. In cases where the number of sub-goals is fewer than five, the available data is allocated across the input cells, while the remaining cells are assigned a value of zero (i.e., unused inputs are set to zero).

The Intermediate Calculation Stage

This stage consists of a network of small randomly initialised values, with values ranging between 0 and 1. The outputs of this stage determine whether specific cells are activated or deactivated in the subsequent stage, namely the output stage. The number of cells in this intermediate layer is six.

The Output Stage

In this final stage, there are five output cells, each corresponding to a specific level of achievement percentage, namely excellent, very good, good, average, and satisfactory.

This system was designed in such a way as to produce outputs with an error rate of not more than 0.01, which was a predetermined condition for obtaining reliable results provided that the number of iterations needed for achieving this accuracy should not exceed 100,000. It is worth mentioning that during the testing stage, the system proved its efficiency as the predicted values showed the error rate corresponding to the assumptions put forward when designing the system. This was done in just 7,984 iterations, which is far from the upper boundary of the iteration limit as shown in [Figure 2](#).

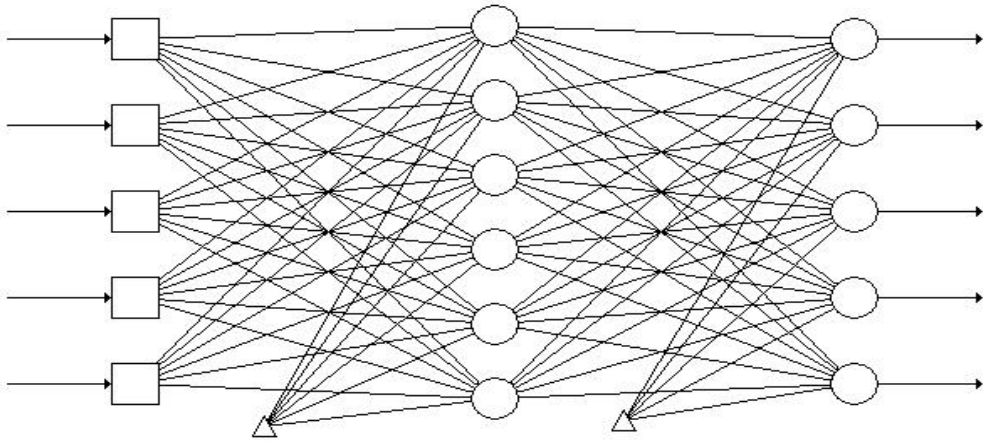


Figure 2: Illustration of the Neural Network of the Proposed System

As seen from [Figure 3](#), the black curve depicts the learning group of the system (30 projects), whereas the red one shows the testing group of the system (10 projects). It may be concluded that the system reaches minimal error rates and achieves the fastest processing time and thus reaches the highest efficiency – 98%.

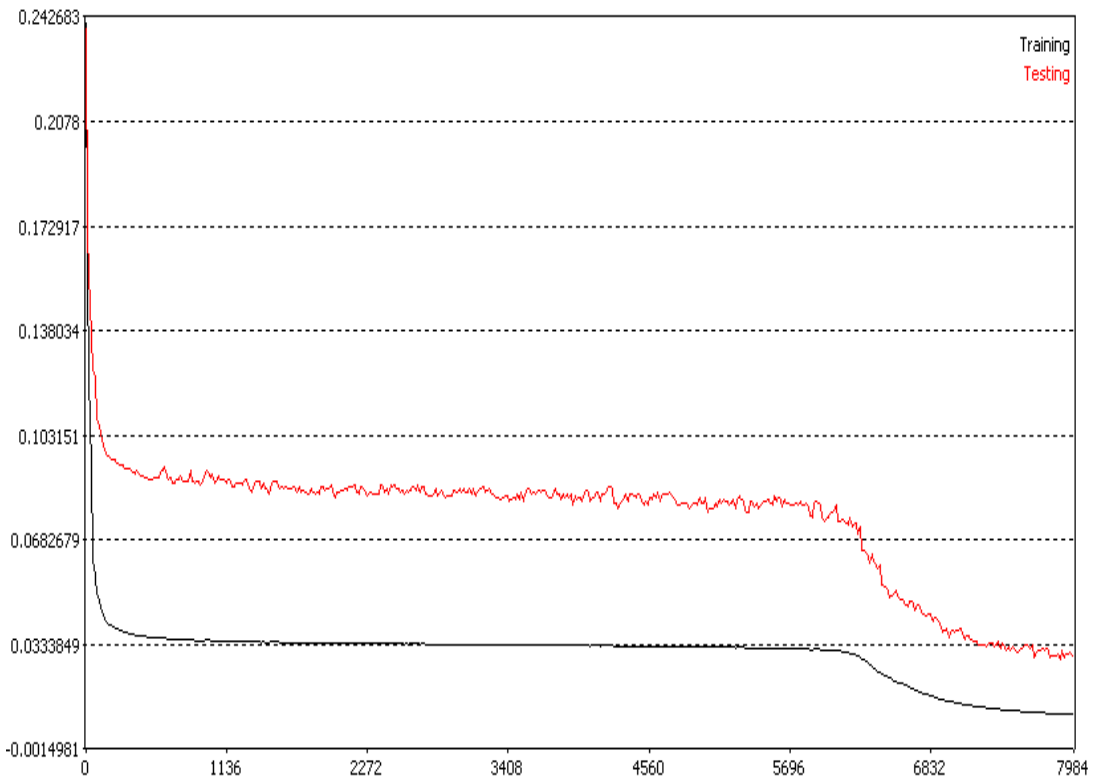


Figure 3: The Relationship Between the Error Rate and the Number of Iterations

The Comparing the Results of the Network

Speaking about comparing the results of the network (the proposed system) with the usual Statistical results, they can be obtained in [Table 2](#). From the table, one can see that all the outputs produced by the proposed system have higher accuracy than those of the traditional evaluation system with accuracy extended up to decimal values. For example, the first output (3.64) of the proposed system is more accurate than the similar output (4) of the conventional system. The same situation takes place in case of all the outputs produced. Additionally, it can be stated that the final output for the set of projects (X) also is more accurate than that of the traditional system. For example, the sixth project got the score of 78.8 under the proposed system, which means that it was classified as "very good". Under the traditional system, it also was evaluated as "very good" but without such a high degree of accuracy as that of the proposed one. These findings prove that the effectiveness index embedded in the NN gives a more precise tool for the analysis and evaluation of the investment projects conducted by the Ministry of Science and Technology.

Table 2: Results of the Proposed System and Statistical Results

X	Y	
	Conventional System	Proposed System
67.5	4	3.64
90	1	1.7
75	3	2.99
85	2	2.13
100	1	0.84
78.8	3	2.67
67.5	4	3.64
75	3	2.99
98	1	1.01
100	1	0.84

CONCLUSIONS

The study focused on examining the effect of the effectiveness index, which serves as one of the financial indicators in assessing investment projects. Investment project objectives' achievement is associated with the use of SMART objectives (specific, measurable, achievable, realistic, and time-bound), as well as the application of NN methods to evaluate investment projects at the Ministry of Science and Technology in Iraq. The research period (2020 – 2023) was chosen for this purpose. The findings of the study are summarized as follows:

- A multi-stage feedback neural network algorithm was employed. The dataset was split into two sets; the first one included 20 projects and was termed as the system learning set. The second set consisted of 10 projects and was named the system testing

set. The effectiveness index was determined to be an exact and reliable indicator of the degree of achievement of the investment project objectives.

- The use and awareness of the effectiveness index were more efficient and provided confidence in investment project evaluation within the Ministry of Science and Technology.
- The preparation of economic feasibility studies and achievement of the investment project objectives within the sample significantly affected the acceptance and funding decisions of the Ministry of Planning.
- The application of neural network algorithms proved to be highly effective in evaluating public investment projects as it achieved a 98% success rate, even in cases of incomplete or inaccurate data.
- All the elements of the economic feasibility form prepared by the Ministry of Planning for public investment projects in Iraq, including those of the Ministry of Science and Technology (research sample), must be clearly defined and completely filled.

Therefore, based on the study's findings, it is recommended to conduct future studies on investment project evaluation. It is important to encourage the project owners to define their goals clearly, which is one of the main requirements in economic feasibility studies. Moreover, the decision makers at the Ministry of Science and Technology should try to encourage project owners to consider the importance of the effectiveness index since it gives a clear idea of project goals and helps make optimal investment decisions. The effectiveness index plays a crucial role in the development process and is extremely useful when evaluating public projects, providing effective allocation of human and material resources.

Moreover, the researchers recommend using systematic methods of analyzing, identifying and measuring investment project objectives with the help of the effectiveness index as a key factor of performance evaluation at the Ministry of Science and Technology. It is necessary to prepare periodic reports on the assessment to achieve success in the project implementation and improve its effectiveness and efficiency. Finally, it is recommended to use advanced computer-based systems and artificial intelligence algorithms at the Ministry of Science and Technology and all related departments and ministries.

REFERENCES

- Abdolrasol, M. G. M., Hussain, S. M. S., Ustun, T. S., Sarker, M. R., Hannan, M. A., Mohamed, R., Ali, J. A., Mekhilef, S., & Milad, A. (2021). Artificial Neural Networks Based Optimization Techniques: A Review. *Electronics*, 10(21), 2689. <https://doi.org/10.3390/electronics10212689>
- Aguilera, R. V., De Massis, A., Fini, R., & Vismara, S. (2024). Organizational goals, outcomes, and the assessment of performance: Reconceptualizing success in management studies. *Journal of Management Studies*, 61(1), 1-36. <https://doi.org/10.1111/joms.12994>
- Ampatzoglou, A., Arvanitou, E.-M., Ampatzoglou, A., Avgeriou, P., Tsintzira, A.-A., & Chatzigeorgiou, A. (2021). Architectural decision-making as a financial investment: An industrial case study. *Information and Software Technology*, 129, 106412. <https://doi.org/10.1016/j.infsof.2020.106412>
- Bolun, I., & Ghetmancenco, S. (2022). Efficiency indices of investment in IT projects with equal lives. *Journal of Social Sciences*(3), 105-120. [https://doi.org/10.52326/jss.utm.2022.5\(3\).08](https://doi.org/10.52326/jss.utm.2022.5(3).08)
- Bosman, L., Hartman, N., & Sutherland, J. (2020). How manufacturing firm characteristics can influence decision making for investing in Industry 4.0 technologies. *Journal of manufacturing technology management*, 31(5), 1117-1141. <https://doi.org/10.1108/JMTM-09-2018-0283>
- Chubarkina, I. Y. (2020). Improving the efficiency of the investment strategy of the development company. International Scientific Conference "Far East Con"(ISCFEC 2020), <https://doi.org/10.2991/aebmr.k.200312.080>
- Czipf, C. (2025). The impact of changing energy prices, interest rates, and investment costs on the net present value and internal rate of return for alternative energy projects. *Discover Sustainability*, 6(1), 161. <https://doi.org/10.1007/s43621-025-00921-7>
- Ghorbani, A. (2023). A review of successful construction project managers' competencies and leadership profile. *Journal of Rehabilitation in Civil Engineering*, 11(1), 76-95. <https://doi.org/10.22075/jrce.2022.24638.1560>
- Glyptis, L., Christofi, M., Vrontis, D., Giudice, M. D., Dimitriou, S., & Michael, P. (2020). E-Government implementation challenges in small countries: The project manager's perspective. *Technological Forecasting and Social Change*, 152, 119880. <https://doi.org/10.1016/j.techfore.2019.119880>
- Güemes, A., Fernandez-Lopez, A., Pozo, A. R., & Sierra-Pérez, J. (2020). Structural Health Monitoring for Advanced Composite Structures: A Review. *Journal of Composites Science*, 4(1), 13. <https://doi.org/10.3390/jcs4010013>
- Haass, O., & Guzman, G. (2020). Understanding project evaluation—a review and reconceptualization. *International Journal of Managing Projects in Business*, 13(3), 573-599. <https://doi.org/10.1108/IJMPB-10-2018-0217>

- Haidari, M. N. (2023). Impact of decision-making on investment performance: A comprehensive analysis. *Journal of Asian Development Studies*, 12(4), 980-990. <https://doi.org/10.62345/jads.2023.12.4.78>
- Han, J. K., Yun, S. Y., Lee, S. W., Yu, J. M., & Choi, Y. K. (2022). A review of artificial spiking neuron devices for neural processing and sensing. *Advanced Functional Materials*, 32(33), 2204102. <https://doi.org/10.1002/adfm.202204102>
- Isai, O., Romashko, O., Semenov, A., Sazonova, T., Podik, I., Hnatenko, I., & Rubezhanska, V. (2021). Methods of multi-criteria evaluation of economic efficiency of investment projects. <https://doi.org/10.5267/j.jpms.2021.1.001>
- Kahdim, R. M., Bari, A. H. A., Daway, A. M., & Flayyih, H. H. (2025). A Financial Examination of the Predicting of Fluctuations in the Price of Oil Using Statistical Models. *Industrial Engineering & Management Systems*, 24(1), 1-9. <https://doi.org/10.7232/iems.2025.24.1.001>
- Karimi, S., Mirzamohammadi, S., & Pishvae, M. (2022). A scenario-based mathematical approach to a robust project portfolio selection problem under fuzzy uncertainty. *Journal of Intelligent & Fuzzy Systems*, 42(4), 4191-4204. <https://doi.org/10.3233/JIFS-210144>
- Karlibaeva, R., Kurbonov, K., Bekimbetova, G., & Shaturayev, J. (2022). The effectiveness of investment projects in development of innovative activities of enterprises. *European Business & Management*, 8(3), 62-71. <https://doi.org/10.11648/j.ebm.20220803.11>
- Lamprou, A., & Vagiona, D. G. (2022). Identification and Evaluation of Success Criteria and Critical Success Factors in Project Success. *Global Journal of Flexible Systems Management*, 23(2), 237-253. <https://doi.org/10.1007/s40171-022-00302-3>
- Li, Y., & Gan, L. (2025). SAIC's Profitability Analysis and Optimization Strategy. *Frontiers in Economics and Management*, 6(10), 100-110. [https://doi.org/10.6981/FEM.202510_6\(10\).0010](https://doi.org/10.6981/FEM.202510_6(10).0010)
- Mathar, H., Assaf, S., Hassanain, M. A., Abdallah, A., & Sayed, A. M. (2020). Critical success factors for large building construction projects: Perception of consultants and contractors. *Built Environment Project and Asset Management*, 10(3), 349-367. <https://doi.org/10.1108/BEPAM-07-2019-0057>
- Mohsin, M. M., Beach, T., & Kwan, A. (2020). Consensus-based urban sustainability framework for Iraqi cities: A case study in Baghdad. *Heliyon*, 6(12). <https://doi.org/10.1016/j.heliyon.2020.e05348>
- Mutambo, N., Mwangi, A., Manda, R., Chiseyeng'i, J., Mashiri, G., & Bwalya, J. (2022). Principles and practices of strategy for effective and efficient performance of business organisations. *European Journal of Business and Management*, 14(14), 52-68. <https://doi.org/10.7176/EJBM/14-14-06>
- Ni, J. (2021). Evaluation of financial investment risk of enterprises. E3S Web of Conferences, <https://doi.org/10.1051/e3sconf/202125303077>

- Petryna, M., Stavnycha, N., Tarayevska, L., Rishchuk, L., & Kushlyk, O. (2020). A methodological approach to the evaluation of the effectiveness of innovative projects. *E3S Web of Conferences*, <https://doi.org/10.1051/e3sconf/202016613018>
- Picciotto, R. (2020). Towards a 'New Project Management' movement? An international development perspective. *International Journal of Project Management*, 38(8), 474-485. <https://doi.org/10.1016/j.ijproman.2019.08.002>
- Rivaldo, Y., & Nabella, S. D. (2023). Employee performance: Education, training, experience and work discipline. *Calitatea*, 24(193), 182-188. <https://doi.org/10.47750/QAS/24.193.20>
- Shayan, S., Pyung Kim, K., & Tam, V. W. Y. (2022). Critical success factor analysis for effective risk management at the execution stage of a construction project. *International Journal of Construction Management*, 22(3), 379-386. <https://doi.org/10.1080/15623599.2019.1624678>
- Shiferaw, A. T. (2024). Effective governance of projects: A mainstay of good public investment. *Procedia Computer Science*, 239, 1612-1618. <https://doi.org/10.1016/j.procs.2024.06.337>
- Sobieraj, J., & Metelski, D. (2023). Identification of the key investment project management factors in the housing construction sector in Poland. *International Journal of Construction Management*, 23(1), 1-12. <https://doi.org/10.1080/15623599.2020.1844855>
- Sun, J., Wang, C. C., Yang, Z., Yu, T., Li, J., & Xiong, X. (2022). Impact of organizational decentralization degree on job satisfaction and job performance: A hierarchical linear model analysis for construction projects. *Engineering, Construction and Architectural Management*, 29(4), 1642-1660. <https://doi.org/10.1108/ECAM-07-2020-0503>
- Volden, G. H., & Welde, M. (2022). Public project success? Measuring the nuances of success through ex post evaluation. *International Journal of Project Management*, 40(6), 703-714. <https://doi.org/10.1016/j.ijproman.2022.06.006>
- Wamba-Taguimdje, S.-L., Fosso Wamba, S., Kala Kamdjoug, J. R., & Tchatchouang Wanko, C. E. (2020). Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects. *Business process management journal*, 26(7), 1893-1924. <https://doi.org/10.1108/BPMJ-10-2019-0411>
- Wang, S., Song, L., Chen, W., Wang, G., Hao, E., Li, C., Hu, Y., Pan, Y., Nathan, A., & Hu, G. (2023). Memristor-based intelligent human-like neural computing. *Advanced Electronic Materials*, 9(1), 2200877. <https://doi.org/10.1002/aelm.202200877>
- Wangchuk, P. (2022). Application of depreciation net present value and internal rate of return in engineering projects a brief literature review. *Journal of Applied Engineering, Technology and Management*, 2(1), 25-30. <https://doi.org/10.54417/jaetm.v2i1.55>

- Yalcin, N., & Alisawi, M. (2026). Facial Emotion Recognition Through a Smart Glasses Prototype: Improving Social Interaction for Visually Impaired Users Through Enhanced Deep Learning CBAM Architectures. *Applied Sciences*, *16*(9), 4415. <https://doi.org/10.54417/jaetm.v2i1.55>
- Zhang, M., Nazir, M. S., Farooqi, R., & Ishfaq, M. (2022). Moderating role of information asymmetry between cognitive biases and investment decisions: A mediating effect of risk perception. *Frontiers in psychology*, *13*, 828956. <https://doi.org/10.3389/fpsyg.2022.828956>
- Zhong, Y., & Wu, X. (2020). Effects of cost-benefit analysis under back propagation neural network on financial benefit evaluation of investment projects. *PloS one*, *15*(3), e0229739. <https://doi.org/10.1371/journal.pone.0229739>