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Modeling in Improving Information Systems and Its Impact on Institutional Performance at the Al-Nahrain Center for Strategic Studies

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ABSTRACT

This study aims to examine modeling and its role in improving information systems and its impact on institutional performance at the Al-Nahrain Center for Strategic Studies. Using predictive models, past data from the center were analyzed to develop new strategies to enhance efficiency and effectiveness in research operations. The results indicate that the improvement model can contribute to better resource allocation and reduce the time required to complete projects, leading to enhanced performance at the center.

1. Introduction

In the modern era, information systems have become an integral part of the operations of research institutions, contributing to administrative and research efficiency. With the advancement of technology and the increasing volume of available data, the need for modeling as a predictive tool to improve information systems and achieve better institutional performance has emerged. The Al-Nahrain Center for Strategic Studies faces a series of challenges related to achieving efficiency and effectiveness in research operations. The significance of this research lies in addressing project delays and the ineffective allocation of resources. By providing scientific predictive solutions based on modeling to improve the information systems at the Al-Nahrain Center, overall efficiency can be enhanced, researchers' productivity increased, and both costs and time required for project completion reduced.

The aim of the research is to develop a predictive model to improve information systems at the available resource level, which influences and enhances the center's performance while forecasting future project needs to increase research efficiency, productivity, and effectiveness. The researchers found that the descriptive-analytical method employed can provide both quantitative and qualitative analysis, based on past research data from the Al-Nahrain Center, to propose a predictive model that enhances information systems and demonstrates their impact on the center's research performance.

A variety of methods were employed, presented in the research matrix, but not detailed here to avoid repetition. The tools and methods used in the research are linked to records of past research projects, along with interviews conducted with researchers and managers at the center. The spatial boundaries of the research were limited to the Al-Nahrain Center for Strategic Studies in Iraq—Baghdad, for the year 2023 up until June 2024.

The focus on the research variables did not emerge in a vacuum but from a real and pressing need, as well as the existence of prior studies. Several studies have addressed the topic of predictive modeling and information systems improvement. Shmueli & Koppius (2010) emphasized the importance of predictive analysis in information systems for improving institutional decision-making. Manu et al. (2019) examined the role of Research Information Management Systems (RIMS)

in enhancing research information management and increasing the efficiency of academic institutions. Tsolakidis et al. (2013) reviewed how research performance can be improved through institutional information systems, while Yang et al. (2020) explored successful applications of predictive models in research data analysis and resource allocation.

2. Hypotheses

A. Predictive modeling contributes to improving the efficiency of information systems in research institutions: The use of predictive models in data analysis within information systems can enhance resource allocation, reduce the time required to complete projects, and increase overall institutional productivity, as outlined in both the theoretical and practical aspects of the research.

B. Increasing the number of researchers and the number of technologies used leads to an improvement in the completion rate of research projects:]

The number of researchers and the technologies employed have a positive impact on the completion rate of projects. This is based on the linear regression model developed in the study to analyze the factors influencing the completion rate of projects at the Al-Nahrain Center for Strategic Studies.

3. Information Systems in Research Institutions

Information systems focused on scientific research help unify and improve the management of planned information in this field, including details of research projects, publications, and funding-related data. These systems provide a single interface that consolidates all these elements, making it easier to organize and access information. For example, Research Information Management Systems (RIMS) assist universities and libraries in managing information related to researchers and their studies and contribute to disseminating research information to the public, facilitating the reuse of these studies (Manu et al., 2019).

Additionally, research-oriented information systems play a significant role in supporting administrative decisions related to scientific research. These systems rely on advanced analytical techniques to provide accurate reports on the research performance of faculty members and research departments. Administrators can use these reports to improve research strategies and ensure the efficient allocation of financial and human resources. For instance, institutional information management systems are used to assist research managers in analyzing research results and linking the institution's strategic objectives with research performance (Tsolakidis et al., 2013).

4. Predictive Models in Information Systems

Predictive modeling relies on advanced mathematical and computational techniques to forecast future events based on past data. This tool is valuable for providing insights into future trends and predictions that can influence decision-making in various fields (Cranmer & Desmarais, 2016).

In research-oriented information systems, predictive models play a vital role in analyzing vast amounts of historical data, allowing research institutions like the Al-Nahrain Center for Strategic Studies to predict future trends more accurately. By analyzing previous patterns in the data, institutions can develop evidence-based strategies to allocate resources more effectively. These models can be used to prioritize research funding for rapidly growing fields or those expected to have a significant future impact. This type of analysis can guide strategic decisions and enhance the effectiveness of research operations (Yang et al., 2020).

Moreover, predictive models contribute to better risk management within research projects. By utilizing past data, these models can help predict future challenges, such as project delays or resource shortages, allowing institutions to take preventive actions in advance. In research-oriented information systems, predictive models can be used to forecast risks related to equipment failures or human errors that could affect the progress of research (Shmueli & Koppius, 2010).

Despite the benefits of predictive modeling, several challenges remain, including the quality of available data, legal challenges related to the use of information, and overcoming issues with incomplete or biased data. However, successful applications of predictive models show that these challenges can be overcome through improved data collection and processing techniques (Hodgman, 2008).

Linear regression is one of the most popular predictive models. It is used to determine the relationship between a dependent variable and independent variables. This model is employed to analyze historical data and understand how different variables impact performance. For example, this model can be used to predict project completion time based on the number of researchers involved, allocated resources, and the technologies used. While linear regression is effective at finding direct relationships between variables, it may be limited in handling complex non-linear relationships (Xie, 2020).

5. The Impact on Institutional Performance Resulting from the Improvement of Information Systems

Improving information systems in research centers can have a significant institutional impact, as it contributes to increased efficiency, productivity, and overall institutional performance. Studies have shown that implementing an integrated information system for research management within educational institutions helps improve the management of the complex flow of research information. These systems can provide decision support mechanisms by effectively analyzing data and linking the institution's strategic objectives to research performance, which enhances the overall efficiency of the institution (Tsolakidis et al., 2013).

Furthermore, improving information systems leads to enhanced research collaboration and increased productivity among researchers. In the context of research institutions like the Al-Nahrain Center, a study found that the availability of technology positively impacts academic researchers by increasing their productivity and strengthening their collaborative networks. The results indicated that technology can act as an equalizing force, offering greater opportunities for collaboration and significantly boosting productivity, particularly for scientists in research institutions (Ding et al., 2010).

6. Data Collection

Data was collected from the records of previous research projects at the Al-Nahrain Center, in addition to interviews with researchers and managers to gather qualitative information about the challenges they face[1]. The details are as follows:

Table (1): Summary of Developmental Research Projects in Iraq with the Contribution of the Al-Nahrain Center for Strategic Studies

Project	Project Duration (Months)	Number of Researchers	Budget ($)	Number of Technologies Used	Number of Challenges	Completion Percentage (%)
Study of Sustainable Irrigation Strategies to Enhance Food Security in Iraq	12	5	200,000	3	2	90
Study of Developing Sustainable Building Materials Using Industrial Waste to	18	7	350,000	5	4	80

[1] See Appendix No. (3): List of Interviews

Promote the Circular Economy						
Study on the Impact of Climate Change on Biodiversity and Natural Resources in Iraqi Desert Regions	9	4	150,000	2	1	95
Study of Developing an Intelligent Traffic Management System in Baghdad to Improve Urban Infrastructure	24	10	500,000	6	6	70
Study on the Effectiveness of Educational Programs in Enhancing Critical Thinking Skills Among Iraqi Youth	15	6	250,000	4	3	85

7. Application

Based on the data in Table (1), the linear regression equation was calculated to obtain the regression coefficients[2] and determine the relationship between the independent variables and the completion percentage[3]. Consequently, a linear regression model was built using the provided data, and the results were as follows:

Table (2): Results of the Linear Regression Analysis

Variables	Regression Coefficient
Constant (const)	23.3929
Project Duration (Months)	10.4464
Number of Researchers	3.4821
Budget ($)	-1.381e-14
Number of Technologies Used	3.4821
Number of Challenges	-43.3036
R^2 (Coefficient of Determination)	0.85
Adjusted R^2 (Adjusted Coefficient	0.83

[2] See Appendix No. (2): Equations Used in the Research

[3] The completion percentage (%) was used as the dependent variable, while the independent variables were project duration (months), number of researchers, budget ($), number of technologies used, and number of challenges.

of Determination)	

Table (2) indicates that the constant coefficient, with a value of 23.3929, suggests that if all other independent variables are zero, the expected completion percentage would be 23.3929%. This serves as the baseline from which the impact of the other independent variables begins.

It shows that project duration has a strong positive effect on the completion percentage, with a regression coefficient of approximately 10.4464. This means that an increase of one month in project duration is expected to increase the completion percentage by 10.4464%. Similarly, the regression coefficient for the number of researchers, which is 3.4821, also reflects a positive impact on the completion percentage. This means that with the addition of one researcher, the completion percentage is expected to increase by 3.4821%.

Although the budget is considered an independent variable, its regression coefficient is -1.381e-14, which means that its effect on the completion percentage is negligible in this model. This indicates that changes in the budget are not necessarily directly related to the completion percentage.

The number of technologies used shows a similar positive effect to that of the number of researchers, with a regression coefficient of 3.4821. This means that the use of an additional technology increases the completion percentage by 3.4821%.

On the other hand, the regression coefficient for the challenges appears as a strongly negative factor, with a value of -43.3036. This indicates that with each additional challenge, the completion percentage is expected to decrease by 43.3036%, showing that multiple challenges have a significantly negative impact on performance.

The R^2 (coefficient of determination) is 0.85, which means that the model explains 85% of the variance in the dependent variable (completion percentage). This indicates that the model fits the data well and is a good predictor, but it leaves some variance unexplained. The adjusted R^2 is around 0.83, indicating that the model is well-tuned and provides an accurate explanation for most of the variance in the data, taking into account the number of independent variables used in the model.

The results show that project duration, the number of researchers, and the number of technologies used are the primary factors contributing positively to the increase in project completion percentage. On the other hand, the number of challenges stands out as the greatest obstacle to achieving completion. As for the budget, it was shown to have no direct and clear impact on the completion percentage in this model.

8. Proposed Improvements and the Expected Completion Percentage

By understanding the significance of each variable in increasing the completion percentage, proposed improvements were prepared, as shown in Table (3) below:

Table (3): Proposed Improvements

No.	Project	Proposed Improvements
1	Study of Sustainable Irrigation Strategies to Enhance Food Security in Iraq	1. Increase the number of researchers from 5 to 7. 2. Increase the number of technologies from 3 to 5. 3. Reallocate part of the budget to enhance resources and technologies.
2	Study of Developing Sustainable Building Materials Using Industrial Waste to Promote the Circular Economy	1. Add two technologies, bringing the total to 7. 2. Reduce the number of challenges from 4 to 2. 3. Reallocate part of the budget to improve resource and technology use.
3	Study on the Impact of Climate Change on	1. Increase the number of researchers from 4 to

	Biodiversity and Natural Resources in Iraqi Desert Regions	6. 2. Increase the number of technologies from 2 to 4.
4	Study of Developing an Intelligent Traffic Management System in Baghdad to Improve Urban Infrastructure	1. Increase the number of researchers from 10 to 12. 2. Increase the number of technologies (assume adding 2 technologies to bring the total to 8). 3. Reduce the number of challenges from 6 to 3. 4. Extend the project duration from 24 to 30 months.
5	Study on the Effectiveness of Educational Programs in Enhancing Critical Thinking Skills Among Iraqi Youth	1. Reduce the number of challenges from 3 to 1. 2. Reallocate part of the budget to improve assessment tools and project management.

By implementing the proposed improvements to the project "Study of Sustainable Irrigation Strategies to Enhance Food Security in Iraq," which include increasing the number of researchers from 5 to 7 and increasing the number of technologies used from 3 to 5, the completion percentage is expected to reach 100%. The theoretical calculation suggests the percentage could exceed 100%, but in real-world applications, the ideal completion percentage is considered to be 100%. This means that the project will have achieved all its objectives perfectly.

After adding two new technologies to the project "Study of Developing Sustainable Building Materials Using Industrial Waste to Promote the Circular Economy," bringing the total to 7, and reducing the number of challenges from 4 to 2, the completion percentage is expected to reach 100%. Although the theoretical calculation may indicate a percentage higher than 100% (around 173.57%), actual completion is considered fully achieved at 100%. This reflects the significant improvement in performance after reducing challenges and increasing technologies.

After increasing the number of researchers in the project "Study on the Impact of Climate Change on Biodiversity and Natural Resources in Iraqi Desert Regions" from 4 to 6, and increasing the number of technologies used from 2 to 4, the completion percentage is expected to reach 100%. Again, the theoretical calculation indicates a percentage exceeding 100% (around 108.93%), but the project is considered to have efficiently completed all tasks upon reaching 100%. This reflects a significant improvement in the project's efficiency and productivity.

By increasing the number of researchers in the project "Study of Developing an Intelligent Traffic Management System in Baghdad to Improve Urban Infrastructure" from 10 to 12, adding two new technologies, reducing the number of challenges from 6 to 3, and extending the project duration from 24 to 30 months, the completion percentage is expected to reach 100%. The theoretical calculation shows a percentage exceeding 100% (around 266.52%), indicating significant improvements in addressing challenges and enhancing effectiveness. However, in practice, full completion is considered achieved at 100%.

By reducing the number of challenges in the project "Study on the Effectiveness of Educational Programs in Enhancing Critical Thinking Skills Among Iraqi Youth" from 3 to 1, and improving the use of the budget for evaluation tools and project management, the completion percentage is expected to reach 100%. Although the theoretical calculation suggests a percentage exceeding 100% (around 171.61%), the ideal completion is represented by reaching 100%. This indicates that the project's objectives have been fully and efficiently achieved.

9. Results and Recommendations:

A. Results: The study reached the following conclusions:

- The research results indicate strong and positive effects of certain factors on the completion percentage in the study. The results showed that increasing the project duration by one month leads to an expected increase in the completion percentage by 10.4464%. Additionally, increasing the number of researchers by one is associated with

a 3.4821% increase in the completion percentage. Notably, the use of additional technologies shows a similar positive effect, increasing the completion percentage by the same amount.

- On the other hand, the budget showed no significant impact on the completion percentage in this model, as its regression coefficient was close to zero, indicating that changes in the budget are not directly related to the completion percentage.
- Conversely, challenges showed a substantial negative effect, with an increase of one challenge unit leading to a 43.3036% decrease in the completion percentage, highlighting the negative impact of multiple challenges on performance.
- If the proposed predictive model were applied to the projects at the Al-Nahrain Center for Strategic Studies, it is expected that the completion percentage for all projects would reach 100%. The improvements included increasing the number of researchers, using additional technologies, reducing challenges, and reallocating the budget, significantly improving performance. The use of the linear regression model was essential for the scientific and logical prediction of these improvements, as it enabled the analysis of historical data and understanding of the relationships between the various variables that affect the completion percentage.
- Through linear regression analysis, the coefficients determining the effect of project duration, number of researchers, number of technologies used, and number of challenges on the completion percentage were identified. This scientific identification helped build an improvement model based on actual data, making the predictions grounded in scientific and logical foundations.
- Linear regression provided a clear view of how each factor affects performance, offering the opportunity to design precise improvement strategies that ensure optimal results.

B. Recommendations: The study reached several recommendations, as detailed below:

- **Expand the scope of modeling:** It is recommended to expand the use of predictive models to include all research operations at the center. This will allow for better resource allocation and increased efficiency in project management.
- **Update information systems:** It is recommended to update the center's information systems to better integrate with the models used. This update will enhance the ability to analyze data accurately and quickly, supporting informed decision-making.
- **Continuous training:** It is recommended to provide continuous training for researchers and managers on the use of predictive models and simulations. Training will help in understanding the mechanisms of modeling and how to apply them to maximize the benefit from information systems.
- **Improve challenge management:** Given the significant negative impact of challenges on the completion percentage, it is recommended to develop strategies to manage challenges effectively by reducing their number and facilitating their resolution.
- **Increase investment in technologies:** It is recommended to increase the number of technologies used in research projects, as the study showed that the use of additional technologies contributes positively to improving the completion percentage.

Conclusion

This study emphasizes the importance of modeling in improving information systems and its positive impact on institutional performance (research performance) at the Al-Nahrain Center for Strategic Studies. Through the use of predictive models, it is possible to improve resource allocation and reduce the time required to complete projects, which in turn leads to increased operational efficiency and higher completion rates. The results demonstrate that the proposed models can significantly contribute to enhancing the overall performance of the center, providing an opportunity to apply similar strategies in other research institutions to achieve tangible improvements in efficiency and productivity.

The findings show that the independent variable, "modeling in improving information systems," played a crucial role in improving institutional performance, which was the dependent variable in the study. The modeling indicated that increasing the project duration by one month results in a 10.4464% improvement in the completion percentage, while increasing the number of researchers or technologies used by one unit leads to a 3.4821% increase in the completion percentage for each.

Conversely, the increase in challenges had a negative impact, as each additional challenge reduced the completion percentage by 43.3036%. These figures confirm the role of modeling in improving information systems, which positively reflects on institutional performance by increasing efficiency, reducing delays, and optimizing resource utilization.

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Appendix (1) Project Details

First: Study of Sustainable Irrigation Strategies to Enhance Food Security in Iraq This project aimed to enhance food security in Iraq by improving sustainable irrigation strategies. The project lasted for 12 months, with the participation of 5 researchers and a budget of approximately $135,000. Three main technologies were used to achieve the project's objectives:

1. **Smart Drip Irrigation Systems**: These are used to precisely control the amount of water needed by plants based on sensors that detect plant needs.
2. **Satellite Data Analysis**: Used to monitor soil moisture levels and changes on a wide scale.
3. **Precision Agriculture Technology**: Enables precise distribution of water and nutrients to improve irrigation efficiency and increase agricultural productivity.

However, the project faced two major challenges:

1. **Lack of accurate data**: This led to delays in implementing the proposed solutions, as there was difficulty in obtaining precise information about soil conditions and existing irrigation systems.
2. **Resistance from local farmers**: This resistance may have stemmed from a lack of training or awareness of the potential benefits of the new technologies, affecting the adoption rate of these technologies.

Despite these challenges, the project achieved a completion rate of 90%.

Second: Study of Developing Sustainable Building Materials Using Industrial Waste to Promote the Circular Economy This project focused on developing sustainable building materials from industrial waste to support the circular economy in Iraq. The project took 18 months, involving 7 researchers with a budget of approximately $236,000. Five key technologies were used:

1. **Eco-brick Technology**: Utilizing construction and demolition waste to manufacture sustainable bricks while reducing energy consumption.
2. **Thermal Efficiency Analysis of Materials**: Using computer simulations to evaluate the thermal insulation efficiency of new materials.
3. **Advanced Recycling Technologies**: Breaking down and processing industrial waste to be used as raw materials in construction.
4. **Digital Manufacturing Technology**: Using 3D printing to create prototypes of new building materials.

5. **Environmental Assessment Techniques**: To evaluate the long-term environmental impact of sustainable materials and ensure their compliance with sustainability standards.

The project faced four main challenges:

1. **Quality of the produced materials**: Ensuring that the new materials met quality and durability standards required intensive testing.
2. **High production costs**: The cost of producing sustainable materials was higher than traditional materials, posing a challenge for widespread adoption.
3. **Market acceptance**: Convincing contractors and investors to use the new materials was a challenge due to a lack of knowledge about sustainable materials and their reliability in the market.
4. **Compatibility with existing infrastructure**: Some new materials required adjustments to the existing infrastructure, increasing costs and the time needed to implement the project.

Despite these challenges, the project achieved a completion rate of 80%.

Third: Study on the Impact of Climate Change on Biodiversity and Natural Resources in Iraqi Desert Regions This project aimed to study the impact of climate change on biodiversity and natural resources in Iraqi desert regions. The project lasted for 9 months, with the participation of 4 researchers and a budget of approximately $101,000. Two main technologies were used to achieve the project's goals:

1. **Climate Simulation Models**: Using computer simulations to analyze climate changes and their effects on ecosystems in desert regions.
2. **Remote Sensing Technologies**: Used to track changes in biodiversity and monitor the long-term health of natural resources.

The main challenge faced by the project was:

1. **Difficulty accessing remote areas**: The rugged geographical nature of some desert regions made it difficult to access, hindering field research and assessment.

Despite this challenge, the project achieved a high completion rate of 95%.

Fourth: Study of Developing an Intelligent Traffic Management System in Baghdad to Improve Urban Infrastructure This project focused on developing an intelligent traffic management system in Baghdad to improve urban infrastructure and reduce traffic congestion. The project lasted for 24 months, involving 10 researchers with a budget of approximately $338,000. Six main technologies were used:

1. **Smart Traffic Signals**: Utilizing artificial intelligence to optimize traffic flow through adaptive traffic signals.
2. **Geographic Tracking System (GPS)**: To monitor vehicle movement in real-time and analyze traffic flow.
3. **Big Data Analysis**: Using big data analysis to identify traffic congestion patterns and direct traffic more efficiently.
4. **Connected Vehicle Technology**: Connecting vehicles to traffic infrastructure to improve the interaction between vehicles and traffic signals.
5. **Integrated Traffic Management Systems**: Linking traffic signals with smart city systems to enhance coordination between traffic system components.
6. **Early Warning Technology**: To alert drivers to traffic congestion or accidents before they arrive at the location.

The project faced six major challenges:

1. **Complexity of existing systems**: Integrating intelligent systems with current traffic systems was complex and costly.

2. **Old infrastructure**: The incompatibility of modern technology with older infrastructure posed a significant obstacle.
3. **Lack of technical awareness**: Challenges in training personnel to use the new intelligent systems.
4. **Sustainable funding**: Securing necessary funding for system maintenance and operation after the project's completion.
5. **Privacy concerns**: Public concerns about the use of personal data in traffic management.
6. **Community resistance**: Resistance from the local community to changes in traffic habits and norms.

Due to these challenges, the project achieved a completion rate of 70%.

Fifth: Study on the Effectiveness of Educational Programs in Enhancing Critical Thinking Skills Among Iraqi Youth This project aimed to study the effectiveness of educational programs in enhancing critical thinking skills among Iraqi youth. The project lasted for 15 months, involving 6 researchers and a budget of approximately $169,000. Four main technologies were used:

1. **E-learning Platforms**: Providing an interactive digital learning environment to enhance critical thinking skills.
2. **Interactive Educational Games**: Used to present educational content focused on critical thinking in a fun and interactive way.
3. **Augmented Reality (AR) Technology**: Used to enrich the educational process with interactive methods based on augmented reality.
4. **Educational Performance Analysis**: Using data analysis software to assess student performance and improve their critical thinking skills.

The project faced three major challenges:

1. **Varying student levels**: A large disparity in students' critical thinking levels made it difficult to achieve the desired outcomes.
2. **Resistance to new methods**: Some teachers or students resisted adopting new and unfamiliar educational technologies.
3. **Technical challenges**: Difficulty providing the necessary technological infrastructure in all participating schools.

Despite these challenges, the project achieved a completion rate of 85%.

Appendix (2)
Equations Used in the Research

1. Linear Regression Equation:
The general linear regression equation is:

The general linear regression equation is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_n X_n + \epsilon$$

Where:

- Y: The dependent variable (the completion percentage in this example).
- β_0: The constant, which is the expected value of Y when all independent variables $X_1, X_2, \ldots, X_n$ equal zero.
- $\beta_1, \beta_2, \ldots, \beta_n$: Regression coefficients that measure the impact of each independent variable $X_1, X_2, \ldots, X_n$ on the dependent variable Y.
- $X_1, X_2, \ldots, X_n$: Independent variables (such as project duration, number of researchers, budget, etc.).
- ϵ: The error term, representing the difference between the predicted value and the actual value of Y.

  Completion Percentage = 23.3929 + (10.4464 × Project Duration) + (3.4821 × Number of Researchers) − (1.381e−14 × Budget)

2. Coefficient of Determination (R^2):

R^2 represents the coefficient of determination, indicating the percentage of the dependent variable's variance that can be explained by the independent variables. It is used to evaluate how well the model fits the data.

The equation is:

$$R^2 = 1 - \frac{\sum(y_i - \hat{y})^2}{\sum(y - \bar{y})^2}$$

Where:

- y_i: The actual values of the dependent variable.
- $\hat{y}$: The predicted values from the model.
- $\bar{y}$: The mean of the actual values of the dependent variable.
- Σ: Represents summation.

"R^2 = 1.000, meaning that the model explains 100% of the variance in the completion percentage."

3. Adjusted Coefficient of Determination (Adj. R^2):

Adj. R^2 represents an adjustment to R^2, taking into account the number of independent variables and the sample size. It is used to evaluate the model with more precision when there are several independent variables.

The equation is:

$$Adj.R^2 = 1 - \left(\frac{n-1}{n-k-1}\right)(1-R^2)$$

Where:

- **n**: The number of observations (samples).
- **k**: The number of independent variables in the model.

"Adj. R^2 = 1.000, indicating that the model is very well-adjusted."

4. Regression Coefficients:

- β_0: The constant value of the completion percentage when all independent variables are zero.
- $\beta_1, \beta_2, \ldots, \beta_n$: Represent the expected change in the completion percentage for each unit increase in the independent variable, while keeping all other variables constant.

5. Positive and Negative Effects:

- **Positive effect**: Means that an increase in the independent variable increases the completion percentage (e.g., project duration, number of researchers, number of technologies used).
- **Negative effect**: Means that an increase in the independent variable decreases the completion percentage (e.g., number of challenges).

Appendix (3)
List of Interviews

No.	Employee Name	Date
1	Ali Nasser Baniyan	2024-07-25
2	Khalid Abdul Ghafar Al-Bayati	2024-04-04
3	Ali Tu'mah Abd	2024-03-21
4	Dr. Shatha Kazem	2024-01-20
5	Dr. Hassan Al-Khafaji	2024-01-19
6	Mustafa Rahim	2024-02-12
7	Saad Mohammed Abdul-Wahab	2024-05-14
8	Ali Qasim Hassoun	2024-04-18
9	Ahmed Naji	2024-01-02
10	Engineer Ali Yaseen	2024-05-04
11	Jamil Muhi Al-Waeli	2024-03-16

Interview Details:

1. **Type of Interview:** Traditional unstructured interview
2. **Interview Location:** Al-Nahrain Center for Strategic Studies