

## **Project Selection and Adjustment in a Multi-Currency Environment: A Case Study of International Business**

**Keywords:** Project selection, Project adjustment, International Project Selection, Multinational Project Selection

### **Introduction:**

In today's globalized world, companies and businesses are operating in different environments more than ever that need accurate planning and resource allocation. In addition to being a method of investment, project selection is necessary in many cases because the nature of many organizations is tied to project selection, so optimization is vital for them. The Project selection and adjustment model provides a framework for companies to address the need for various optimization issues such as profit maximization, cost minimization, delay reduction, etc. in different scenarios.

Most of the mathematical models focused on the selection of new projects. Shafahi and Haghani (2018) developed a mathematical model for project selection with different assumptions to include more issues of the real world. RezaHoseini et. Al. (2020) mathematical model for project selection considered delay and incompatibility among projects.

Project scheduling is also an important issue that researchers developed in many types of research along with project selection. Tirkolaee et. Al (2019) addressed the multi-objective project scheduling problem with multi-mode and multi-resource assumptions. Zolfaghari and Mousavi (2021) developed a mathematical model for project selection and scheduling with flexible resources that completed the previous research.

The need to optimize pe-existed projects resulted in the concept of project adjustment. Huang and Zhao (2016) represented a mathematical model for project selection and adjustment with uncertain measures to complete previous research in this area. Heidari-Fathian and Davari (2019) developed a Bi-objective mathematical model for project selection and adjustment that considered the time value of money.

Operating in different countries, especially for project selection, results in multiple exchange and tax rates which double the need for a precise framework for optimization. Zhang et. Al (2011) developed a mathematical model for multi-national project selection, considering various parameters such as construction cost, annual net operating cash flow, terminal values of the projects, and also foreign exchange rates. Su et. Al (2013) represented a model for project selection and adjustment in an international environment. Huang et. Al (2014) provided a mathematical model for multi-national project selection with random parameters.

Despite the many efforts to develop mathematical models for project selection considering different assumptions that make it closer to the real world, this subject still needs development in

the international environment with multiple exchange and tax rates.

The purpose of optimization differs based on the scenario and the need of decision-makers, so it is necessary to develop a comprehensive mathematical model to consider different assumptions for the Project Portfolio Selection Problem (PPSP) and then, include multiple exchange and tax rates to use the mathematical model as a comprehensive framework in an international environment.

### **Research questions:**

1. What are the critical factors in a multi-national project selection and adjustment problem?
2. What parameters should be considered for the mathematical modeling and solving it using operations research algorithms?
3. How can this mathematical model answer the need for optimization in different organizations?

### **Aims and Objectives:**

This research aims to develop an international project selection and adjustment mathematical model to optimize project selection in a multi-currency environment. The model is based on operations research and mathematical modeling techniques.

The specific objectives of this research are:

- To identify the decisive criteria for project selection and adjustment in a multi-currency environment.
- To develop a mathematical model to optimize project selection based on the identified criteria.
- To validate the model using real-world data from reliable resources.
- To propose suggestions for future research and also consider the mathematical model as a crucial part of a business plan.

### **Methodology:**

The proposed research will be based on a mixed-methods approach, combining both quantitative and qualitative data to prepare for the mathematical model. The financial and non-financial records on past and current projects are crucial as the quantitative data. The approach to collect qualitative data is interviews with key stakeholders, including project managers, finance managers, and senior executives are on the agenda.

Data collection occurs in two groups of organizations:

1. Companies that have international experience, especially investment or project selection. The literature review is not enough to gather data on important criteria for mathematical

modeling and the key is to inquire in person. The interview is a simple but effective method and can provide valuable information to the researcher, although it is cheap or free.

2. Companies that do not have international experience, small businesses that are still growing in particular. The reason for the choice is to determine obstacles to growth, international activity, and entering new projects

The collected data will be used to identify parameters for project selection in a multi-currency environment and develop a mathematical model, such as linear programming, and multi-criteria decision analysis, and will be validated using real-world data.

Data analysis is based on Descriptive statistics and Statistical inference if necessary. The results indicate what trends affect an organization's decision to select or adjust a project more. It can also derive useful information from previous research papers.

Two common objective functions for a project selection problem are maximizing income and minimizing delay. To address other needs, it is important to collect data from different companies and define additional objective functions in the mathematical model.

After developing the mathematical model, we will solve it using pre-existed algorithms. There's also a need to develop a new algorithm after that for three reasons:

- Solve the model with fewer resources (Time, software, etc.).
- Reach a globally optimized solution if already not obtained.
- Solving more complex models in the future (non-linear mathematical models in particular).

The mathematical model will be solved after every progress, using GAMS software to test it gradually and also record different data for sensitivity analysis. After reaching a suitable mathematical model, we will solve it using Python programming since the model is complex and the GAMS software is not enough. In addition, Python provides a better framework for developing a new mathematical solution (Algorithm).

### **Project Plan:**

The proposed project plan needs 48 months and will involve the following activities:

- Literature review (Months 1-6): A comprehensive literature review to gain familiarity with the PPSP in an international environment.
- Data collection and analysis (Months 6-12): This involves collecting financial and non-financial data on past and current projects of the case study to identify the key criteria for project selection in a multi-currency environment.
- Model development (Months 12-33): This will involve developing a mathematical model that can optimize project selection based on the identified criteria.

- Model validation and implementation (Months 33-42): This will involve validating the model using real-world data. If possible, the mathematical model will be used on a larger scale in a business.
- Proving future research path (Months 42-48): create a road map for future research. The obtained information from the previous stage will be helpful since it contains practical insight into real-world problems.

### **Conclusion:**

The proposed research will use mathematical modeling and operations research to optimize the project selection and adjustment problem in a multi-currency environment with multiple exchange and tax rates. The research will contribute to business development, Operations research, and Decision-making, and provides a more systematic and efficient approach to project selection.

The expected outcomes are as follows:

1. Identifying critical factors and criteria for project selection and adjustment in the international environment.
2. A mathematical model that is a framework for selecting and adjusting projects in the multi-national context.
3. Validating the mathematical model using real-world data.
4. Providing a direction for future research.

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