

## **ABSTRACT**

The inclement weather has an effect on the building construction projects duration and cost of projects. It causes stoppage in the projects and makes delays. Most of the project managers have problem to estimate the projects duration properly regarding to uncertain conditions such as weather risks and so on. Due to many weather factors that affect projects duration the principal component analysis (PCA) is used to reduce unnecessary factors. Also the priority and the importance of determined factors are evaluated using and analytical network process (ANP). A time series ARIMA model is used to forecast weather variables which are determined by the PCA and ANP methods. The forecasted value of weather variables will be applied in the multiple non linear regression models to estimate the human resource productivity, supplier efficiency and material norm which affect on duration of the project. .Based on this situation a decision making model which is multiple non linear regression models is proposed to estimate the duration of each activity on conditioned with the human resources productivity, supplier efficiency and material norm. Finally a decision support system is proposed to help project managers to make an accurate estimation for each activity.

## ABSTRAK

Teknologi Maklumat adalah penting dalam sesebuah organisasi dan tidak boleh dipandang ringan, namun sistem dibina dengan teknologi ini cenderung menghadapi ancaman dan pelbagai risiko. Salah satu kaedah untuk menghadapi dan mengelakkan daripada risiko adalah dengan menggunakan *Business Continuity Planning (BCP)*. *BCP* yang sebelum ini diperkenalkan khusus untuk sektor ICT kini telah digunakan secara meluas ke pelbagai sektor. Kajian kes yang dilaksanakan oleh penyelidik adalah berkaitan dengan organisasi yang belum melaksanakan *BCP* dan belum dapat mengenalpasti dan mengurangkan ancaman, secara spesifiknya sistem MyLINE. Dengan mengadaptasi *BCP* dalam MyLINE, aras ancaman telah dinilai, maka beberapa strategi pengurangan risiko telah dicadangkan. Dalam pada itu, *Business Impact Analysis (BIA)* yang juga dilaksanakan menunjukkan impak pelbagai insiden kepada pihak berkepentingan. Akhirnya, satu *BCP* telah dihasilkan untuk MyLINE agar pihak berkepentingan dapat merancang dengan lebih teratur agar risiko dapat dikendalikan dengan lebih sistematik.

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## **CHAPTER 1**

### **PROJECT OVERVIEW**

#### **1.1 Introduction**

In every construction projects there are a lot of uncertain factors that affect to the different aspects of the project. The concern about the prediction of a project's cost and duration can be traced back to many years ago and in recent years the managers pay attention to the risks that caused by the weather factors. The risk of weather for the construction projects affect to the duration and cost of the projects directly. Predicting the proper duration of activities in the building construction project is useful for the building construction managers.

Weather impact was reported to be one of the main factors causing delay on construction projects[1]. According to Osama Moselhi, Daji Gong, and Khaled EI-Rayes suggested that almost 50% of construction activities are sensitive to weather conditions[2].

For making a precise decision, a construction manager must know the key factors and variables that affect to the building construction projects duration. The science and technology of forecasting weather risk can mitigate the risk of delay in the building construction projects and can increase the efficiency of the decision making to finish the project on time with minimum error in estimating the project duration. The effect of weather's factors on the building construction projects in different region and also in different time is not constant so the pattern of the weather's factors shows that which factors has more special effects on projects' delay. Also the amount of resources which are required for building construction activities with regard to the pattern of the weather's factors is crucial to estimate the duration of the project

In this project report, The crucial variables involved in the building project are identified and the pattern of the weather's factors is determined based on the pattern of the weather and resources the duration of each activity is formulated. The proposed model helps making decision in planning and scheduling the construction projects.

## **1.2 Problem Background**

Responsibility has become a slogan of the late 1990's for construction industry. Owners must contend with the increasing costs of design, construction, and financing. Consequently, customers are demanding that contractors complete the projects quickly and efficiently and avoid costly delays, changes, and rework whenever possible. Construction professionals try to get the job under continuous pressure for scheduling and being within budget to avoid claims at the end of the project[3]. The industry is looking for reliable technology tools that will recognize

problems sooner and get the work done on time without additional and unnecessary accountability.

The impact of predicting and capturing the effects of inclement weather on construction projects is becoming widespread in both public and private sectors. The cities which are located in the south of Iran expose to different situation of weather that should be predicted accurate for the construction projects. There are many types of estimation for the project duration such as PERT method, but this method is related to the expert and adequate experience but with this new model, it does not necessary to be expert and have a lot experience to estimate the duration of building construction projects.

Ronda Levin mentioned in 2010 that there are some disadvantageous of using pert method such as:

There can be potentially many activities and individual dependency relationships, so it causes complexity in computing duration of the projects. It requires too much work because it takes a lot of work to come up with the numbers used in the PERT formula especially if the project manager is calculating the estimated duration for each work package on an individual basis. Because of this, the pert formula might be said an inefficient method of estimating the duration for the project. One of the biggest disadvantageous of PERT formula is often times duration is under-estimated rather than accurately estimated or over-estimated. Under-estimation of time can cause huge problems in project management. Not only can it cause the project to fall behind, but it can also cause overages in budget when employees are either forced to pull overtime to meet project deadlines[4].

In this project report by using statistical method that include the weather parameter causes delay in the site, estimation of activities duration will be more precisely and the decision maker can make more accurate decision for the project schedule. Statistical models such as a regression model could help the managers to rely on their claims and increase the owner satisfaction. Statistics serves to evaluate the quality of information in the face of uncertainty.

### **1.3 Problem statement**

In term of problem statement, we keen to answer the following questions about building construction projects. For estimating the risk of inclement data in duration of activities in building construction industry following questions can be considered.

- What are the patterns of the weather's factors that affect building construction duration?
- What are the resources and their patterns that affect building construction activities?
- What are the importance and weights of different weather factors which are involved in construction projects?
- How to make a model to forecast the value of weather factor in future?
- How can we formulate the duration of construction activities?

#### **1.4 Objectives of the project**

- To identify weather's factors that affect building construction duration
- To identify the resources factors and their patterns that affect building construction activities.
- To identify the importance and weights of weather factors and resources required in building construction projects
- To design a time series model to forecast the weather pattern related to a project.
- To design a regression model to predict the duration of each activity.

#### **1.5 Scope of project**

This project covers construction activities and focus on effects of weather on activities in the south of Iran cities such as Kish Island. The final statistical model will show the effect of inclement weather on the delay of construction projects and help the managers to reduce the risk of projects. The data set will be collected from the Meteorological organization of Iran and building construction project in the Kish Island in Persian Gulf.

#### **1.6 Significance of project**

By identifying the impact of weather risk, we could minimize the financial Impact of weather delays on a building construction. Based on our proposed model, managers can make a reliable decision based on the proposed formula and

data to be gathered. And, it is not necessary that the decision maker be an expert to estimate the project duration, that is, this model is suitable for the manager who is not skilful in a building construction project. Based on this model, a decision making model will be made for managers to evaluate the risk scheduling of construction.

## **1.7 Conclusion**

In short, this project is about the study of making a statistical model for estimating the risk, resources, and duration of activities in the construction project. Based on this model, we proposed to develop a decision support system. In this chapter we mentioned the problem statement, objectives of the project, scope, and significance of the project. In the following chapters we will discuss about the previous study, literature review and the methodology which will be used in this project, Data analysis and conclusion.