Optimization of NPV in the RCMPSP under Multi-skill Conditions with using from the PSO Algorithm

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***Abstract*—Since the topic of project scheduling directly and indirectly effects the cost, duration, and resources, we focus on this issue. If we want to manage the cost of a project or program, we need to scheduling project Managing and how resources are allocated to reduce costs and prevent the occurrence of shortages.**

This article examines the state of RCPSP, in which a set of several projects is considered and some of the resources are multi-skilled. In this paper, due to the existence of several projects and resource constraints, there is the possibility of a shortage of resources that we will avoid by proper timing and allocation of resources.

***Keywords*— Optimization of NPV, PSO Algorithm.**

I. Introduction

The resource constrained project scheduling problem (RCPSP) has been widely studied in the OR community for several decades. The classical RCPSP schedules activities, often to minimize the project makespan, subject to the technological and/or organizational precedence constraints and the limited availability of resources. And here the order of RCMPSP is resource constrained multi project scheduling problem that is being used in the program.

This paper aims to maximize NPV using appropriate timing and optimal resource allocation, and Dr also considers. We have tried to consider the situation in a way that is very similar to reality, so that it can be used in the industry as well.

We have chosen the assumptions and variables with this approach, in order to do this, we have to use a network of activities and a set of financial and consumer resources in order to realize our goal with this information.

The assumptions of this article are as follows:

1. Consider the discount rate
2. Multi-project
3. Multi-skill
4. The time and the number of activities are clear
5. The amount and type of resources available is clear

The constraints of this article are as follows:

1. Consider dependencies
2. Capital constraint
3. The amount of resources allocated to each activity should be at least as much as the activity needs
4. Resource constraints

Using Pso meta-algorithm, we will model these conditions in such a way that its output is an optimal time schedule for projects and allocation of resources so that there is no shortage. Finally, the goal of this project is to increase the NPV by taking into account the discount rate.

Explain the variables:

Cj: Cash flow node i
Dr: discount rate
ti: time to realize node i
tij: ij activity time
Cij: cash flow activity ij
NNp: number of project nodes p
NAp: The number of project activities p
PR: A set of projects
Np: The set of project activity p
SR: A collection of prohibitive skills r

SK: A set of skills available
R: Resources Collection
T: total project time
Cci: Cost of node i
Ccij: The cost of ij activity
CAt: available capital at time t
RrA: Source available
Xjpst: If activity j in project p with skill s at time t takes1.

II. Literature Review

In this paper, we study the capital-constrained project scheduling problem with discounted cash flows (CCPSPDC) and the capital- and resource-constrained project scheduling problem with discounted cash flows

(CRCPSPDC). The objective of both problems is to maximize the project net present value (NPV), based on three cash flow models. Both problems include capital constraints, which force the project to always have a positive cash balance. Hence, it is crucial to schedule activities in such an order that sufficient capital is available. Pieter Eyman, Mario Vanhoucke (2017).

The majority of research studies the resource constrained multi-project scheduling problem in a deterministic environment, regardless of the uncertainty nature of the environment. In this paper, we assume that the activity duration is a stochastic variable, and propose two new robustness

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measures to analyses the performance of priority rules under a stochastic environment. A full factorial experiment is designed to solve the problem and investigate the relationship between project characteristics and the performance of priority rules. Furthermore, a trade-off relationship between the quality and robustness is investigated and the best priority rules are recommended from both a project and portfolio managers perspectiveYantingWang, ZhengwenHe, Louis-Phillipe Kerkhove and Mario Vanhoucke (2017).

In this paper we investigate one of the most recent extensions of the Resource Constrained Project Scheduling Problem (RCPSP): The Multi-Skill Resource Constrained Project Scheduling Problem (MSRCPSP). For this complex problem we propose the use of a parallel scheduling scheme. Such scheme has been successfully applied to the RCPSP. Nevertheless, in order to apply it to the MSRCPSP two new concepts are developed: resource weight and activity grouping. We discuss such concepts and use them for the new heuristic framework proposed. A series of computational tests performed using a large number of instances and reported in this paper shows that the new heuristic is very effective in finding high quality solutions within very small CPU times Bernardo F.Almeida, Isabel Correia, Francisco Saldanha-da-Gama(2016).

In this paper, the resource-constrained project scheduling problem with general temporal constraints is extended by the concept of break-calendars in order to incorporate the possible absence of renewable resources. Three binary linear model formulations are presented that use either start-based or changeover-based or execution-based binary decision variables. In addition, a priority-rule method as well as three different versions of a scatter search procedure are proposed in order to solve the problem heuristically. All exact and heuristic solution procedures use a new and powerful time planning method, which identifies all time- and calendar-feasible start times for activities as well as all corresponding absolute time lags between activities. In a comprehensive performance analysis, small- and medium-scale instances are solved with CPLEX 12.6. Furthermore, large-scale instances of the problem are tackled with scatter search, where the results of the three versions are compared to each other and to the priority-rule method Stefan Kreter, Julia Rieck, Jürgen Zimmermann (2016).

This paper addresses the resource-constrained project scheduling problem with flexible resource profiles (FRCPSP) in continuous time. In contrast to the discrete-time system, each task may start, end, or change its resource allocation at any point in time. The additional decisions for the continuous times of these events greatly amplify the problem complexity. We propose a mixed-integer linear

programming model together with problem-specific inequalities and heuristic time limits, both of which are applied in the branch-and-cut procedure. In addition, the fractional period-width preprocessing and heuristic as well as the event estimation method are proposed to estimate the time and event parameters. Through the computational results, we investigate the pros and cons of the continuous-time model against the discrete-time counterpart both in terms of solution quality and runtimes, as well as the effectiveness of the preprocessing and different solution procedures Anulark Naber (2017).