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Work Breakdown Structure in Project Management with Soft Logics

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Abstract— This paper presents a Work Breakdown Structure (WBS) based model for repetitive projects when considering soft logic. Previous researches are based on the assumption that work sequence cannot be changed for different work zones. In reality, work sequence between work zones are not fixed (actually, constantly adjusted) throughout the project. Instead, they are often changed to shorten the construction time and minimize the total cost. Scheduling with the non- fixed work sequences between work zones is known as the soft logic method. Considering the soft logic in repetitive projects, the proposed WBS model aims to assist the project team to find the minimum overall cost subjecting to different output rates and logical sequences. The software used in this work is Oracle Primavera P6. Unlike same scheduling software programs that are somewhat of a bottom up approach, Primavera P6 encourages to create a WBS at the beginning of the project.

Key words- WBS – Work Breakdown Structure LOB - Line Of Balance

I. INTRODUCTION

The main objective of this project is to assist the building entrepreneurs by developing a work breakdown structure by taking in to account of soft logics which can be used for repetitive construction projects. Operation under continuously changing environmental conditions are being involved in complex and unique projects, which require multidisciplinary collaboration, construction companies have to develop realistic schedule and update them regularly. Increasing competition within the industry also forces construction companies to provide products of higher quality, in shorter durations, for lower costs and under safer working environments. Obviously, it is not possible to achieve these objectives simultaneously in the absence of adequate schedule.

II LITERATURE REVIEW

A. Primavera Method

Project monitoring and control is the process of collecting, recording, and reporting information concerning project performance. Project controlling uses the data from monitor activity to bring actual performance to planned performance. The present study deals with the project monitoring process of ‘Standard Design Factory”, a four storied (G+3) factory building whose construction is in progress at Cochin, Kerala. A comparison between the planned progress of construction work and actual progress is performed in this study using project management software Primavera P6. Despite well-established principles and policies of project monitoring the process itself may not be efficiently accomplished in a project, because of those practical problems existing or arising in the project. Such an attempt in realizing the practical problem in implementation of project monitoring and control will contribute to proper recognition of the problem areas and putting in place the control process to rectify the deviations.

B. Genetic Algorithm Based Optimization Model

Genetic algorithm based optimization model for repetitive projects when considering soft logic. There have been several models developed for Time -cost Trade-Off optimization in repetitive projects and these models were set up to search for optimum output rate that yields the minimum total cost for each project. Previous researches are based on the assumption that work sequence cannot be changed for different work zones. In reality, work sequences between work zones is known as soft logic method. Considering the soft logic in repetitive projects, the

proposed GA model aims to assist the project team to find the minimum overall cost subject to different output rates logical sequences.

C. Line of Balance Method

The line of balance (LOB) method has long been used to model construction projects with repetitive units. Critics, however, indicate two major shortcomings of applying LOB in the construction industry (1) it has not yet been adapted to numerical computation as readily as network methods; and (2) it relies on restrictive assumptions and therefore cannot treat the practical concerns concluded in this paper. To treat all the practical concerns and provide necessary calculation power, a new scheduling system is proposed: The Repetitive Scheduling Method (RSM) and its computerized implementation, Repetitive Project Planner (RP2). RSM includes necessary modelling elements (i.e. activity and relationship types) and a set of computational algorithm to calculate the start time of every activity as well as the minimum project duration. RP2 automatically calculates and generates RSM diagrams that are particularly useful in serving as a test- bed for managers to perform what it analyses for different crew utilization strategies. A real- life pipeline project is used to demonstrate the application of RP@ and to compare that with the critical path method(CPM) and traditional LOB models.

D. Lscheduler Application

Lscheduler application involved in the development of an object- oriented model for scheduling of repetitive construction projects such as high – rise buildings, housing runways, pipeline network, bridges, tunnels, railways, airport runways, and water sewer mains. The paper provides an overview of the analysis, design, and implementation stages of the developed object oriented model. These stages are designed to provide an effective model for scheduling repetitive construction projects and to satisfy practical scheduling requirements. The model incorporates newly developed procedures for resource-driven scheduling of repetitive activities and non-repetitive scheduling techniques. The model is named LSCHEDULER and is implemented as windows application that support user-friendly interface including menus, dialogue boxes, and windows. LSCHEDULER can be applied to perform regular scheduling as well as optimized scheduling. In optimized scheduling, the model can assist in identifying an optimum crew utilization option for each repetitive activity in the project that provides a minimum duration or cost for the scheduled repetitive construction project.

E. Critical Path Method

Repetitive construction projects require schedules that ensure continuity of work for the resource crews while scheduling repetitive projects. Existing resource driven techniques for scheduling repetitive projects either ensure complete crew work continuity or minimum project duration, considering same resource crew to perform a task in all repetitive units. However, repetitive construction projects with multiple crew availability for tasks are common in construction industry.

F. Fuzzy Linear Programming

Scheduling problem for repetitive construction projects involves three conflicting objectives. These objectives are project duration, project total cost, and project total interruption time. This paper presents a multi- objective fuzzy linear programming model (FLP) for resolving this problem. Literature concerned with scheduling problems for repetitive construction projects was reviewed. Multi- objective fuzzy linear programming was then explained. The proposed model formulation was then presented.

G. Repetitive Project Planner – Resource Driven Scheduling

Waste (unforced idleness) in repetitive projects is observed when labor and equipment (resources) are waiting, being idle, because the preceding resources have not finished their jobs. In this paper they investigate the existence and influence of unforced idleness.RP2 can also serve as a test bed for analyzing buffer strategies. The means to place capacity buffers is called “underloading’: making assignment to resource that absorbs less than 100% of its capacity (Lean Construction Institute 2000). Underloading is also recognized as ‘balancing production.” A procedure for balancing production deserves detailed discussion.

H. Object Oriented BIM Using JAVA

This method to integrate time and schedule data of construction projects using object- oriented

modeling. Although, many researchers have recognized the importance of data integration and have suggested methods to associate time- and cost – related data, the information models and methodologies developed to integrate time and cost information are not being utilized widely in daily practice. The reason for this includes that current construction management information systems do not yet orovide the functionality to efficiently deal with time and cost information to better aid project managements. Therefore, an object-oriented modeling methodology based on BIM is suggested in this research, in which the time and cost data integration is achieved by parameterizing construction operations in objects. For observing applicability of the modeling method, a prototype has been developed using JAVA that this paper presents a discussion about implementing the integration model in the programming language as well.

I. Janus, a Knowledge Based Time – Cost Tradeoff Simulator

Robotic construction equipment will need to plan and re-plan in response to rapidly changing site and external market conditions of a project. A group of researchers at Stanford University is conducting research on the potential of artificial intelligence (AI) techniques to develop enhanced tools for generating plans and schedules automatically from CAD descriptions of facilities. Currently available network- based project scheduling tools provide capabilities for heuristic resource leveling and resource- constrained scheduling; however, are only of limiting value in marking time – cost tradeoff decisions when project completion times must be shortened. To address this limitation, the authors are developing JANUS, a knowledge – based system for simulating and analyzing time cost tradeoff issues on facility projects in more detail. This paper lays out the rationale underlying the design of JANUS, and describes the architecture of a prototype system developed using IntelliCorp's KEETM knowledge processing environment.

J. Discrete Time – Cost Trade Off Problem

The discrete time/ cost trade-off problem (DTCTP) is commonly encountered in repetitive project scheduling. The current models for this problem assume that logical sequences of activities cannot be changed in different units. However, logical sequences are often chan ged to shorten the project time and minimize project total cost in many practical situations. This characteristic of repetitive activities is referred toas the soft logic. This paper presents a mixed integer nonlinear programming model that combines the general DTCTP and the concept of soft logic. The ececution modes of an activity in different units are also considered. The DTCTP is known to be strongly NP-hard, and the introduction of soft logic makes it even more complex. A genetic algorithm (AI) is proposed to resolve the problem. The effectiveness off the proposed GA is verified using the example of a bridge construction project presented in the previous literature. The model proposed in this paper provides more edibility to reduce the total cost and time of a repetitive project for the planners

III. METHODOLOGY

The use of project management software as a tool for managing and organizing work has grown and continues to grow at a rapid pace in all industries. PM software packages usually use priority rule based heuristic algorithms or the resources levelling, but they do not give information about the details of algorithm such as scheduling scheme, priority rule and the type of process whether it is statics or dynamic.

1V. FLOW CHART

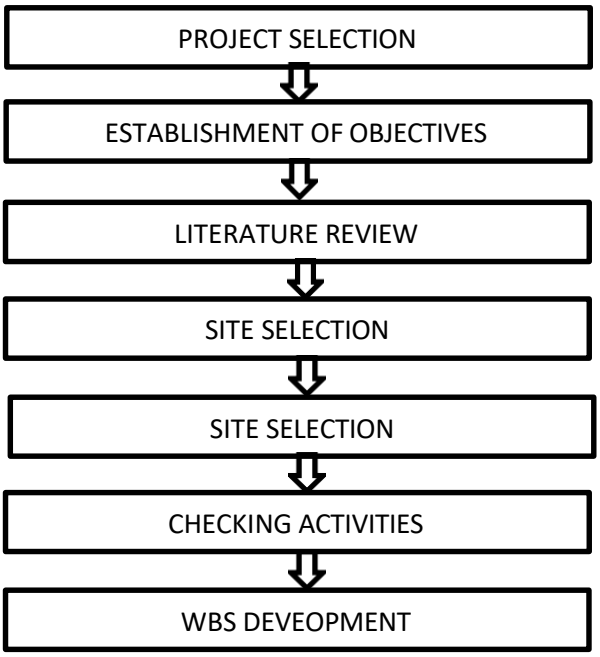
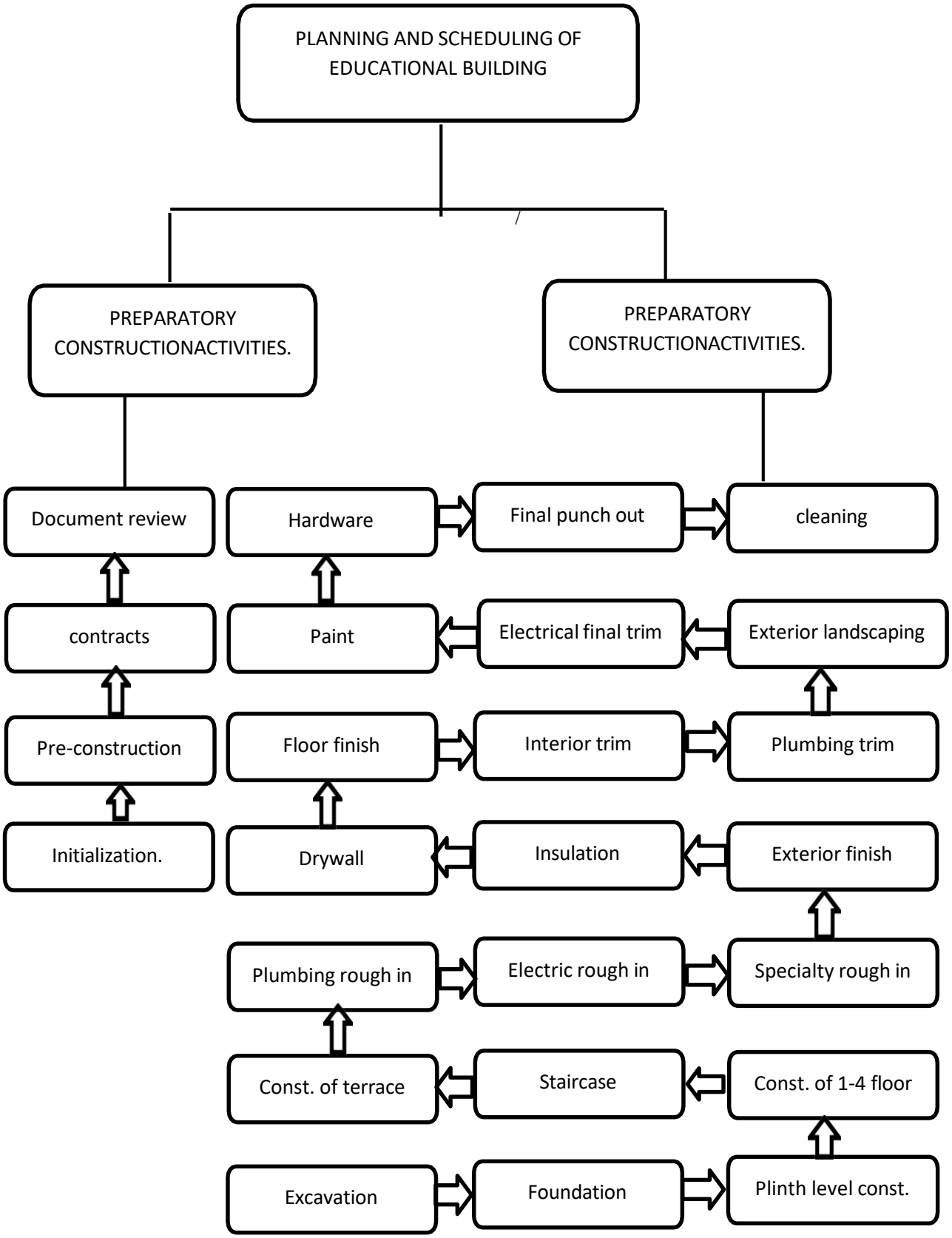


Figure 2 WBS for Educational building


PLANNING AND SCHEDULING OF EDUCATIONAL BUILDING
PREPARATORY CONSTRUCTIONACTIVITIES.
PREPARATORY CONSTRUCTIONACTIVITIES.
Document review
contracts
Pre-construction
Initialization.
Hardware
Paint
Floor finish
Drywall
Final punch out
Electrical final trim
Interior trim
Insulation
cleaning
Exterior landscaping
Plumbing trim
Exterior finish
Plumbing rough in
Const. of terrace
Excavation
Electric rough in
Staircase
Foundation
Specialty rough in
Const. of 1-4 floor
Plinth level const.

V. CONCLUSION

Construction management is the procedure of planning, coordinating and providing monitoring and controlling of a construction project. Construction management includes five stages; design, pre-construction, build and owner occupancy.

A case study of a G+4 residential building located in Byculla, Munbai is considered for the development of work breakdown structure. The case study focuses on planning and scheduling using Microsoft Project software. A detailed work breakdown structure which enlists the pre-construction and construction activities is prepared which is further classified into various sub construction activities. A work breakdown structure is an important tool for project management as it provides a visual aid to communicate specifics and manage particulars of the project that would otherwise be more difficult.

The above given information is meant to provide insight to the project. The purpose is to make a detailed case study of a construction building. The concept of work breakdown structure remains the key process and independencies of the various activities. Finally developed work breakdown structures overviews in all the execution process for construction of building in micro level.

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