

قال تعالى

سَمِيعٌ رَّبِّكَ الَّذِي خَلَقَ (1) خَلَقَ
نَسَآنَ مِّنْ عَلَاقٍ (2) أَفَلَا تَكْزُمُ
الَّذِي (عَلَّمَ) بِالْأَلَمِّ (4) نَسَآنَ
مَا لَمْ يَعْلَمْ (5)

صدق الله العظيم
سورة العلق

Pledge:

I pledge to all what has been in this research is the performance of the researcher and her efforts were personal, and work from the period 2011 to 2016 in Khartoum State, and the researcher distributed the questionnaire to the companies by herself to collect information.

Acknowledgement

First, all my thanks go to **ALLAH** almighty for showing me the right way to finish this work.

Secondly, I would like to deeply thank my supervisor **DR/Salma Yahya Mohamed** who has always guided me with valuable information and complete support until the last moment.

Deep thanks to all the staff in the Civil Engineer Department, Sudan University Of Science & Technology for giving me all the help in the right time especially **DR/Osama M. Ahmed**, the MSc program coordinator for giving me always new chances to continue.

Thanks to MR/ Mohyeldin Mohamed Ibrahim teacher in analysis and statistics unit khartoum University to analysis my data with Statistical Package for Social Sciences (SPSS).

My thanks to **Engineer / Nour Ahmed Elnour** who helped me in obtaining some answers by distributing a number of my questionnaires forms .

Moreover thanks for all my loving family members, especially my mother/ **Kawther Mohamed Ahmed** for her great love and support and my, brother the **website designer MR/Mirghani Abd Elhai Mirghani** who helped me in using some computer programs.

Thanks to My friends especially **Engineer/Fikry Ibrahim**, **Engineer/Sarah Abdelaziz Mohamed** and **Engineer/Rania Abdelhafiz** .

Finally I would like to show some appreciation to everybody stood with me in any way and I missed to mention them .

God bless you all

Thank you

Amel Abd Elhai 2016

Abstract

This study addresses the planning and scheduling in construction projects and considering the main drivers of planning and how to set up tables and updated.

In this context, the study came to the tools used in the planning and techniques used and the comparisons to determine the most appropriate way and evaluated in the construction industry in Sudan, taking into account the experiences in dealing with these tools and techniques and where it stands projects, including management.

The primary goal of the research is scientific knowledge for planning, scheduling and the extent of their application in construction projects in Sudan and knowing the obstacles that hinder their application and learn how to develop a scientific plan and the ability to apply it correctly.

It was adopted by the questionnaire to study the problem of the search, and were selected from the 37 inquiries in the construction of the questionnaire as the most inquiries that affect the planning and scheduling process in the field of practice of the construction industry in Sudan. It was distributed to a variety of sample consisting of 30 engineers from the public and private sector has been the use of statistical software to analyze the results of the questionnaire.

The results showed that there are some deficiencies in the general concept for dealing with planning and scheduling in the construction industry environment in Sudan, in addition to not fully know the types of effective tools and techniques for planning and follow-up and appropriate uses. An analysis of the survey results gave it the most common reasons that lead to failure to achieve the project objectives (quality - cost - time).

The study found several key points to consider when planning and scheduling. The study also recommended several ways for the development of project management in the formulation of planning and scheduling.

المستخلص

هذه الدراسة تتطرق إلى التخطيط والجدولة في مشاريع التشييد و تدرس الدوافع الرئيسية للتخطيط وكيفية إعداد الجداول وتحديثها.

وفي هذا السياق تعرضت الدراسة إلى الأدوات المستخدمة في التخطيط والتقنيات المتبعة وعمل مقارنات لمعرفة انسب الطرق وتقييمها في صناعة التشييد في السودان، آخذة في الاعتبار الخبرات في التعامل مع هذه الأدوات والتقنيات وأين تقف إدارة المشروعات منها.

الهدف الأساسي من البحث هو المعرفة العلمية للتخطيط والجدولة ومدى تطبيقهم في مشاريع التشييد في السودان ومعرفة المعوقات التي تعوق تطبيقها ومعرفة كيفية وضع تخطيط علمي والمقدرة على تطبيقه بصورة صحيحة .

تم اعتماد طريق الاستبيان لدراسة مشكلة البحث، و من تم اختيار 37 استفسار في بناء الاستبيان باعتبارها أكثر الاستفسارات التي تؤثر في عملية التخطيط والجدولة في مجال ممارسة صناعة التشييد في السودان. وتم توزيعه علي عينة متنوعة مكونة من (30) مهندس من القطاع العام والخاص وتم استخدام البرنامج الإحصائي لتحليل نتائج الاستبيان.

أوضحت النتائج أن هنالك بعض القصور في المفهوم العام للتعامل مع التخطيط والجدولة في بيئة صناعة التشييد في السودان، إضافة إلى عدم الدراية التامة بأنواع الأدوات والتقنيات الفعالة للتخطيط والمتابعة وملائمة استخداماتها. وتحليل الاستبيان أعطت النتائج إنها من أكثر الأسباب التي تؤدي إلى عدم تحقيق أهداف المشروع (جودة - تكلفة - زمن)

خلصت الدراسة إلى عدة نقاط أساسية يجب مراعاتها عند التخطيط والجدولة كما أوصت الدراسة بطرق متعددة لتطوير إدارة المشاريع في صياغة التخطيط والجدولة.

List of Table of Content

Title	Page
آية قرآنية	I
Pledge	II
Acknowledgement	III
Abstract	IV
المستخلص	V
Table of content	VI
List of Tables	VII
List of Figures	X
Chapter One: Introduction	
1.1 General	2
1.2 Research problem	4
1.3 Research Questions	5
1.4 Research Objectives	5
Chapter Two: Literature Review	
2.1 Linear Scheduling Method (LSM	9
2.2 Research Efforts for Linear Scheduling Method	11
2.3 Other Approaches to Linear Scheduling	11
2.4 The reason for planning	14
2.5 Bar charts and linked bar charts	15
2.6 Advantages of bar charts and linked bar charts	16
2.7 Disadvantages of bar charts and linked bar charts	17
2.8 Network analysis the critical path method	17
2.9 Advantages of networks	19
2.10 Disadvantages of networks	20
2.11 Precedence diagrams	21
2.12 Principles of line of balance	24

2.13 Time - change diagrams	27
Chapter Three: The Research Methodology	
3.1 General	37
3.2 Research Sample	37
3.3 The questionnaire design	7
3.4 Questionnaire piloting	37
Chapter four : Conclusions and Recommendations	
4.1 Conclusions	74
4.2 General Recommendations	75
4.3 Recommendations for future researches	78
References	79
Appendix	81

List of tables

Description	Page No
Table 3.1 sample configuration according to academic qualification	39
Table 3. 2 years of experience	40
Table 3. 3 Company Classification	41
Table 3.4 Project Type	42
Table 3. 5 The Motivation reasons for planning	43
Table 3.6 type of manage the construction projects	44
Table3.7 selection technique used in project planning	45
Table 3. 8 Tools used for project planning	46
Table 3.9 Successful project attributes	47
Table 3. 10 Resource and labour required for each activity	48
Table 3.11 monitor performance:	49
Table 3.12 modern tools for project planning	50
Table3.13 important standard in project classification	51
Table 3.14 Available resources to determine the duration	52
Table 3.15 Schedule regular updates	53
Table 3.16 follow-up reports to evaluate project performance	54
Table 3.17 realistic relations between activities	55
Table 3. 18 Adjust activity which has constant duration	56
Table 3.19 prepare time schedules	57
Table 3.21 The timing for schedule preparation	58
Table 3.22 Elements of the time schedule estimate	58
Table 3.23 modified schedule during the implementation stages	59
Table 3.24 the difference between planned time and actual time	59
Table 3. 25 Emergency lack of liquidity of the company	60
Table 3.26 unexpected damages in machines	61
Table 3. 27 Difficult to comply with the specifications	62
Table 3.28 Lack of objectivity when preparing the schedule	63
Table 3.29 The weakness of the company's management	64
Table 3. 30 Lack of technical expertise	65

Table 3. 31 Positivity of follow-up the construction stages	66
Table 3.32 the effect of accurate planning in project success	67
Table 3.33 compatibility between available resources and needs	68
Table 4.34 follow-up implementation and overcome the obstacles is the basis of planning	69
Table 3.35 resolve scheduling problems by computer software	70
table 3.36 models computer programs to determine schedules	71
Table 3.37 Desire for using computer programs in time scheduling	72

List of figures

Description	Page No
Figure 3.1 sample configuration according to academic qualification	39
Figure 3.2 years of experience	40
Figure 3. 3 Company Classification	41
Figure 3.4 type of manage the construction projects	44
Figure 3. 5 selection technique used in project planning	45
Figure 3.6 resource and labour required for each activity	48
Figure 4.7 modern tools for project planning	50
Figure 3. 8 important standard in project classification	51
Figure 3.9 Available resources to determine the duration	52
Figure 3. 10 Schedule regular updates	53
Figure 3.11 follow-up reports to evaluate project performance	54
Figure 3.12 realistic relations between activities	55
Figure 3.13 adjust activity which has constant duration	56
Figure 3.14 unexpected damages in machines	61
Figure 3.15 Difficult to comply with the specifications	62
Figure 3.16 The weakness of the company's management	64
Figure 3.17 Lack of technical expertise	65
Figure 3. 18 Positivity of follow-up the construction stages	66
Figure 3.19 the effect of accurate planning in project success	67
Figure 3.20 compatibility between available resources and needs	68
Figure 3.21 follow-up implementation and overcome the obstacles is the basis of planning	69
Figure 3.22 resolve scheduling problems by computer software	70
Figure 3. 23 models computer programs to determine schedules	71
Figure 3. 24 Desire for using computer programs in time scheduling	72

بسم الله الرحمن الرحيم



SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF GRADUATE STUDIES



Planning and Scheduling of Construction Projects in Sudan

التخطيط والجدولة في مشاريع التشييد بالسودان

*Thesis submitted in partial fulfilment of M.Sc. degree in
construction management*

PREPARED BY:

Amel Abd Elhai Mirghani

SUPERVISED BY:

Dr. Salma Yahya mohamed

April 2016