Ministry of Higher Education
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College of Engineering

"ADOPTION BUILDING INFORMATION MODELING BIM TECHNOLOGY TO COMPARE METHODS OF COMMUNICATION BETWEEN THE DESIGN AND IMPLEMENTATION ENTITIES IN CONSTRUCTION PROJECTS"

A Thesis Submitted to Council of College of Engineering, University of Diyala in Partial Fulfillment of the Requirements for the Degree of Master of Science in Civil Engineering

by

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We certify that we have read the dissertation titled (**Adoption Building Information Modeling (BIM) Technology to Compare Methods of Communication Between the Design and Implementation Entities in Construction Projects**) and we have examined the student (**Zainab Anwar Abd- Alkareem**) in its content and what is related with it, and in our opinion it is adequate as a dissertation for the **Degree of Master of Science in Civil Engineering** .

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Dedication

To my father

To the women who always support me.

.....My mother .

To my brothers .

With my love and respect .

Eng. Zainab

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ABSTRACT

" COMPARING THE COMMUNICATION METHODS IN IRAQ CONSTRUCTION PROJECTS DURING THE IMPLLEMENTATION STAGE"

Construction projects distributed in many places,varity of work type , have multi disciplines these have big effect on communication management , therefore this research studies the ability to use advanced communicative tools such as computer mediated communication (CMC) instead of traditional communication face to face (FTF). Revit application which is based on BIM technology have been used and it helps in exchanging design information between the designer and the site engineer for rapidity in making decisions , solving problems ,reducing wasted time and reducing the expenses that are spent as a result of the use of FTF communication .The results which were concluded from this research are that communicative quantity in FTF was more than in CMC ,but it is indicating that communication in CMC might be more productive than communication in FTF.In addition, the working time in CMC was slightly higher than in FTF.This indicates that CMC was slightly more productive than FTF . Wasted time for FTF consistently is higher than wasted time in CMC and this is because FTF was easier than CMC in terms of social speech. To identify the degree of collaboration between users two methods were used so the the total number of exchanges in CMC was higher than in FTF because most persons were having more interaction when they used CMC. Moreover, the cumulative productivity in CMC was higher than of FTF and this indicates that CMC communication provides agood environment for collaborative work which ,in turn ,it increases team , also researcher study relation between team productivity and communication parameters ,there is a strong correlation factor between team

productivity and total number of work related words in both FTF and CMC for each time interval and this relation was negative in FTF while positive in CMC for 16 experiments . For number of exchanges which consider is a measure of the degree of collaboration, the correlation was strong between productivity and number of exchange in both communication techniques. Finally team productivity was a negative relationship with wasted time and positive with working time.

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ABBREVIATIONS and SYMBOLS

AEC	Architecture engineering and construction
BDS	Building Description System
BIM	Building Information Modeling
CMC	Computer mediated communication
CSCW	Computer support collaboration work
$\overline{D}$	The mean difference score
EI	Emotional Intelligence
FTF	Face to face meeting
ICT	Information communication technology
NOE	Number Of Exchanges
ROI	Return-on-Investment
RFIs	Request For Information
S_D	standard deviation of the difference scores.
TNOWs	Total Number of Words
TNWRWs	Total Number of Work Related Words
TNN-WRWs	Total Number of non Work Related words
VOIP	Voice Over Internet Protocol
VT	Virtual team
VR	Virtual reality
WT	Working Time

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Construction industry has been characterized by uncertainty, and adversarial attitudes for a long time because luck of expertise, professional skills, educational background, computer acquaintance , and working environment among the project participants . All these impede the information administration and communication of the project team. Also, the productive environment (construction work site) is often remotely managed by designers' office which has a big effect on the accomplishment of a complete design and construction .Which would lead to additional effort of information management and communication process between project manager and design teams , and also it leads to a difficult access to project information by project participants in construction sites (Arayici , et al ,2012).

For eliminating which obstacle, it is necessary to develop the collaboration and interaction between stackholders.

This research contributes in making a best understanding of the issues related to information flow management when using centralized platforms. It will permit us to demonstrate the degree of usefulness and practicality of BIM (Building Information Modeling) as technologies and processes which are considered the best solution for poor information management processes within the construction project network (Azouz et al. , 2014). . The research adopted resolving problem task which is related by arriving at the best solution when designers collaborate with site engineers through using two forms of communication models face to face

(FTF) and computer mediated communication (CMC) . Autodesk Revit Architecture version 2015 has been used in this research which has many advantages to make people who are geographically distributed in different areas and sites collaborate .

1.2 Research Justifications

- Construction projects distributed in many places,varity of work type , have multi disciplines, therefore this research studies the ability to use computer mediated communication instead of traditional communication .
- This study is very important in Diyala governorate because of security issues and the difficulty of making traditional meetings between designers and site engineers.
- Inactive communication administration framework in building projects in Iraq .
- Poorly managed communication led to conflicts among parties, de-motivated force, slowing down in the entire job , failure in work , rework and delay in making decisions .

1.3 Research Objectives

- Using BIM as a means of communication in CMC and compare it with FTF ,using BIM will improve the control of the project during the implementation stage and reduce the travelling cost .
- Investigate the indirect cost of the project, maintaining the duration of the project constantly without delay, as well as maintaining the quality of the work during implementation.

- Measuring the amount of collaboration , team productivity in each method and illustrating the method which has been got a high score in productivity aspect.

1-4 Strengths & Limitations

- This study has several notable points of strength like:

- The research will measure the amount of the communication occurred between users in FTF and CMC. This amount is represented by the total number of words.
- The research will found out which method has more working time and wasted time.
- The research will Measure degree of collaboration between users in two methods which are represented by number of exchanges.
- The research will Measure productivity in each method and study the relationship between team productivity and many elements such as work related words, the number of exchanges, working time and wasted time and showing which method would give strong or weak relation with these elements.

As with all research, this study has many limitations such as:

- Experiments that have conducted among users in different directorates ,but each experiment was done in one building in different rooms because of the difficulty of controlling the team by the researcher in two places which are far geographically distributed specially that teams are not familiar with Revit.
- The researcher can conduct 16 experiments only , because of the difficulty in obtaining volunteers who could not spend more than an hour

working with us and the difficult travelling with three laptops and two stands to install cameras.

- It was difficult to train people how work in Revit because some of them do not have any idea about using Revit so the researcher gave them a short course in Revit to make them use this software and this was very hard and costed more time.

1-5 Outline of the Thesis

Abstract of the contents of the next chapters is as follows: -

- Chapter one contains introduction , research justifications, research objectives,strengths and limitations.
- Chapter two contains details about the literature review for this study and the important previous studies in this field.
- Chapter three includes the research methodology used in this study and illustrated the requirements needed for the experiments, illustrated context implementation of the experiments.Also ,it dealt with explaining what is needed in the experiments, and classification and analysis of the results. Finally, major consideration of using Revit in this research
- Chapter four contains results which have been obtained of conducting the two methods : the total number of work and non work related words which represented the communication quantity between users : working time,wasting time and undefined time in the two methods; number of exchanges which show which method that has a high degree of collaboration team productivity in each method and the relationship between the team productivity and many other elements such as work related words, number of exchanges, working time and wasted time and showing which method gave strong or weak relation with these elements.
- Chapter five includes conclusions which we got of the research and recommendations for future studies.