

Effect of Technology on Improving Directions of Construction Projects

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Abstract:

The Building and construction division plays a major role in the Industry, particularly the businesses which grows and develops the Industry. Technology as well as technological support in construction job might impact the methods of construction in addition to several features of construction process (design and manage project, communicate and Completion during project, requirements and problems of project, speed of Completion of a project, cost of project, and Sustainability of project), those aspects should be considered and some resolutions should be recommended. The objective of this research is to examine the impact of technology on developing directions of building constructions in Jordan and to identify the impact of technology on some particular aspects of construction project. The author applied a descriptive analytical approach in order to gather the data. The outcomes of the research indicated that there is a statistically significant impact of the impact of technology on project management and design of constructions, a statistically significant impact of the impact of technology on developing communication as well of project completion of constructions, a statistically significant impact of the impact of technology on developing necessities and concerns of project of constructions, a statistically significant impact of the impact of technology on developing the speed of project completion, a statistically significant impact of the impact of technology on developing project budget and cost, and additionally there is a statistically significant impact of the impact of technology on developing sustainability of project of constructions. The research suggested containing information regarding what is useful from the workers' technological capabilities, the odds for progressions on their work and how those employees are influenced by the conditions of their work, interest of applying technology in constructions to preserve the sustainability of the surroundings as well as resources, and including employees in training courses in order to use technology which is reflected positively on the economic returns of the organization.

Key words: Construction Projects, Effect of Technology on Construction Projects, Directions of Construction Projects.

Chapter one

0.1. Introduction

Nowadays, the technologies used in manufacturing as well as construction are evolving, yet not closely to the equal amount. Some of the reasons of the dissimilar amounts of change could be established in the core alterations among manufacturing as well as construction. Construction is unavoidably the process of moving and assembling resources in addition to apparatuses into a finished, prepared facility. Though several construction procedures are considered cyclic, they have attained neither in a stable sequence nor at a stable location. Similarly, while construction, dissimilar to manufacturing, rarely involves production of a delimited product, preserve the material in order to provide the buying function, expediting function, warehousing function, as well as the release, is considered way more complex. For many of these effects, the necessary construction procedure of building brick by brick has remained unaffected since the middle Ages.

Over the past decade, the influences of technology on construction have varied in regards to the type of construction which is being executed, but generally, the alterations have been immensely improved. Constructors in these days are very similar to the constructors during the middle Ages. At some point, conversely, there is a very high probability for significant improvements which will differ in the leading nature of building construction. These improvements took an advantage from advancements which are already clear in other fields. Those developments will be considered global in the substance and in extent, with solicitations driven by the continuous technological developments and competitive pressure (Khatatbeh, 2015). They will comprise direct technological influences on the performance of construction actions and key alterations in the way of establishing a project.

The denotations of "Construction" besides "Technology" seems appropriate to start with construction because this is considered as the fundamental action to those Information Technology approaches applied. The purpose of construction actions is to form art facts like buildings, roads, subways, as well as bridges. IT and Construction field influences the design, construction, operation in addition to maintenance. Particularly, it is substantial to pressure the addition of maintenance and operation because of an important component of the information used throughout these phases which originates during the plan and construction. It is correspondingly essential to comprise the manufacturing of the building resources required in addition to public planning and inspection actions, actions which frequently are ignored in process representations of construction. IT could be recognized as the application of electronic machineries and software for the processing, storing, transmission and presentation of information. Currently, when the response

was under process, the concept of electronic data processing, stayed communal. Communications technology is nowadays an essential part of information technology. Our definition not only includes computers and their software, but as well the devices like the phones, the photocopying machine, in addition to the TeleFax (Shelke and, Bhangale, 2013).

Construction joins together a hypothetical framework to predict engineering activities, in addition to systematically handle projects and the business through the use of the estimates and observing data, to attain assessable project aims.

1.1. Importance of the study

The building construction field takes a huge part in the industry, mainly the businesses which improve the Industry as a whole. Construction fields are additionally recognized as a crucial part of job formation as well as developing the economy, Emerging technology along with construction forms additional environments besides generating more outcomes than sustainable building. Technology in addition to technological support in Construction project might influence the directions of construction and several features of construction (design and project management, communication and project completion, project necessities and concern, duration of project completion, project budget as well as costs, and project sustainability) such elements should be considered and some resolutions should be recommended

1.2. Statement of the problem

It is apparent that technology has an essential role in both developing and advanced Industries. Nonetheless, applying technology in the directions of constructions is facing many obstacles and is influenced by several elements. It regularly directs to a set of disagreements upon influences when requested to classify the most significant aspects disturbing their directions of constructions at a provided point in time. This research will attempt to resolve these variances or bridge the gap among the different opinions. In actual fact, directions of constructions in Jordan is concentrated on various influences.

1.3. Purpose of the study

The aim of this research is to examine the influences of technology in improving directions of constructions in Jordan, in addition to identify the impact of technology on (design and project management, communication as well as project completion), of construction project.

1.4. Questions of the study

Main Question

Is there effect of technology on improving directions of building constructions?

Sub- Questions of the study

1. Is there effect of technology on improving design and manage projects of building constructions?
2. Is there effect of technology on improving communication and Completion during projects of building constructions?
3. Is there effect of technology on improving requirements and problems of projects of building constructions?
4. Is there effect of technology on improving speed of Completion of projects of building constructions?
5. Is there effect of technology on improving cost of projects of building constructions?
6. Is there effect of technology on improving Sustainability of projects of building constructions?

1.5. Hypotheses of the study

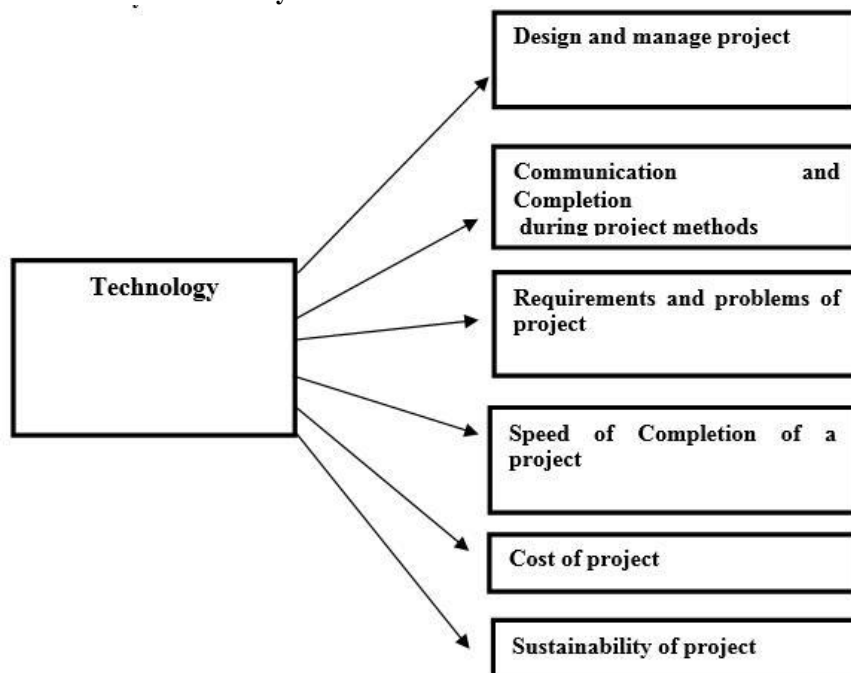
The main Hypothesis is:

H₀: There is no effect of technology on improving directions of construction projects.

From this hypothesis, it found the following sub-hypotheses:

- H₁:** There is no effect of technology on improving design and manage of construction projects.
- H₂:** There is no effect of technology on improving communication and completion during projects of construction projects.
- H₃:** There is no effect of technology on improving requirements and problems of construction projects.
- H₄:** There is no effect of technology on improving speed of Completion of construction projects.
- H₅:** There is no effect of technology on improving cost of construction projects.
- H₆:** There is no effect of technology on improving Sustainability of construction projects.

1.6. The model of the study



1.6.1. Dependent variable: Technology

1.6.2. Independent variables: (design and manage project, communication and Completion during project, requirements and problems of project, speed of Completion of a project, cost of project, Sustainability of project)

Chapter two

Literature review

Previous studies

Sepasgozar, et al (2015) presented in their research the main resources of construction projects interruption in Iran, in addition, the researchers provided a review of works associated with delay in construction projects. Furthermore, the research provided a rapport between new technologies and time infested in construction projects. One of the leading reasons of delay in several projects is that they apply an old generation of technologies for construction; though, implementing technology is yet ignored. With the intention of collecting first-hand data in order to sightsee the delay resources, skilled project directors of the residential as well as industrial projects were enlisted. Well experienced specialists from 26 businesses took part in this research. 73 delay sources were acknowledged in the sample projects, whereas 25 issues were connected to the new technology constraint. The outcome of the research contributions policy makers as well as practitioners to comprehend the concrete factors which causes the delay. The significance of the research is that it examines three core problems like rate of recurrence, level of severity, in addition to the significance of each feature. Dissimilar to other researches, the study concentrates on technology qualities which might influence the project time and scheduling. (Sepasgozar, et al,2015)

A study conducted by the Construction Training Fund (2014) aimed to classify new technologies or methods in the Construction Industry which can necessitate new training or up-skilling of the skills as well as semi-skilled staff. Site visits were done in addition on-site sessions by Training Support Officers, Face-to-Face sessions were directed and Telephone Interviews plus email analyses in order to collect data. The results indicated that the technology could do several things such as: Trades reduction; (Bricklayers & Plasterers). additional occupations to eliminate: where most traditional skills will drop if wall construction approach alters. In addition to Traffic Controllers. Skills increasing: (such as Cabinet makers, Steel fixers, Wall and Floor Tillers, Carpenters, Concreters, Drainers, Wall & Ceiling Fixers, Plumbers, Roof Plumbers, Additional occupations likely to increase: (such as Installation Teams, Draftsperson, Electrical (in-house contracting), Truck Drivers, Residential Building Trades, Frame welders, Crane Drivers, Computer Technicians) Up-skilling required:(Carpenters) Readily. (Construction Training Fund,2014)

While another study conducted by Kang (2013) quantitatively searched the interpretation that the profits of IT marked themselves through development in work procedures. Sequentially, improved work procedures lead to augmented project performance. Through the use of an overall sample of 133 projects from the Construction Industry Institute Benchmarking and Metrics database, this research examines the associations among technology usage as well as integration, superlative practices, project performance evaluated

with cost, schedule, as well as rework metrics. The data was also used to evaluate the opposite communication between technology usage, work procedures as measured by superlative performs, and enactment. The results indicated that there are restricted important beneficial associations between IT usage and performance, somewhat more important beneficial associations between best practice usage and performance, and numerous important correlations among IT use and the application of Best practices. Interaction influences the joint use of IT and best practices against performance are evaluated, finding many positive associations, though restricted data availability averts robust statistical assessment. Generally, the research resulted that there is proof that the profits of information technologies in construction are found through alterations in work procedures. **(Kang , et al,2013)**

While Sargent et. Al (2012) highlighted in their study that acknowledging the elements which could affect an individuals' motive to apply technology could help administrators to develop strategies in order to upsurge and enhance the uptake of technologies and develop the innovation adoption procedure. The researchers used a case study for organizations, to identify the factors in the unified theory of acceptance and Use of Technology (UTAUT) are inspected and the UTAUT is protracted and by comprising resistance to change as well as top management support. The results of the study indicated effort expectation, internal assisting conditions in addition to top management support all affect an individuals' intention to apply information technology. The outcomes of the study have also indicated that resistance to change or even fear of change does not constantly play a role in innovation adoption. The results support the necessity to support new technologies from both a managerial as well as technical perspective. **(Sargent, et al, 2012)**

Chapter Three

Methods and Procedures

This chapter contains description of study methodology, population and sample in addition to the chosen method as well as the tool used to collect data, also procedure of construction or development necessary steps to ensure its veracity and consistency. Furthermore, practical procedures and statistical processing are used in the treatment of the study data as the following:

Study Methodology:

Researcher used descriptive analytical method which is based on the data collection, classification, organization and analysis.

Study population:

Population of the study consisted of all mangers in the construction industry in Jordan.

Study Sample:

The study sample was selected randomly based on Demographic variables (age, and gender) from the population of the study equivalent to (50) managers of construction projects in Jordan.

Table (1) Sample Characteristics table

Variable	Category	Frequency	Percentage
Gender	male	30	60%
	female	20	40%
Age	20- less than 30	13	26%
	31- less than 40	11	22%
	41- less than 50	12	24%
	51- less than 60	10	20%
	More than 61	4	8%

- 1- The table above indicates in the Age variable, that the age (20- less than 30) has the highest percentage among the total sample, this category got (13) out of the total sample (50), which is (26%). As for the age group (More than 61), it got the least percentage which is (4) out of the total sample (50), which is (8%) in the Age variable.
- 2- The table above indicated that in the "Gender" variable the category that has taken the highest percentage is (male), this category got (30) among the total sample (50), which is (60%), as for the "female" category, it got (20) out of the total sample (50), which is (40%) in the Gender program variable.

Instrument of the study:

To realize the Effect of technology on improving directions of construction projects in Jordan in this study, the researcher built and developed preliminary questionnaire which consists of (18) items for this matter through revising the literature review and the previous studies which related to the content.

Reliability

To ensure instruments reliability and validity researcher presented preliminary questionnaire to a number of questionnaire arbitrators and judges who are experts and specialized in this field, who were selected in an intentional manner from some of mangers of construction projects in Jordan In order to ensure that each statement clarity and accuracy of the context, and how suitable is the form of the field which is being measured

and their suitability to the aims of the study. And the arbitrators for the preliminary study tool form an approval of 80% and more on evidence of items sincerity was based on proposals of members of the arbitration, and has become in its final form consisting of four fields through (18) items. Table (2) Cronbach alpha value

Cronbach alpha	items	field
%0.80	18	Effect of technology on improving directions of construction projects

Table (2) shows that the value of Cronbach's alpha is more than 60%, and this means that the study tool is acceptable for purposes of scientific research.

The level of scale answer for each paragraph was, according to five point Likert scale identified as follows: one - represents Strongly Agree, two - represents agree, three - represents normal, four - represents disagree, five - represents strongly disagree. Likert scale was used to judge the results which were divided into High, Average and Low according to the following standard:

The highest value - minimum value of alternatives/ Number of levels Therefore, the level of response are as follows:

Low level if it was $1+1.33=2.33$

Average level if it was $2.34+1.33= 3.67$

High level if it was 3.86 and more = 5.00

Validity

To ensure stability, the researcher adopted the method of testing and retesting. Questionnaire has been distributed to a number of manger of construction projects in Jordan. Twenty mangers of construction projects are from outside the study sample, as it was re-applied to them after two weeks, where as the value of Pearson's correlation coefficient is (0.83), its high value and forms acceptance for the purposes of this study.

Statistical treatment:

For achieving the purpose of statistical treatment, the following statistical methods were used:

1. Mean and standard deviations.
2. T-test statistical (One Way Anova) and (Shaffee) test for dimensional comparisons where necessary.
3. The equation of Cronbach alpha and Pearson's correlation coefficient.

Furthermore, practical procedures and statistical processing are used in the treatment of the study data.

Chapter Four

Data Analysis

First: according to (study questions) the study showed that:

- 4.1 **Results related to the First question**, which is: "Is there effect of technology on improving design and manage projects of building constructions?"

A linear regression of the field was obtained and Table 3 shows the results.

Field	R value	R square	Sum of squares	B value	significance level
effect of technology on design and manage project of building constructions	.366 ^a	.134	14.835	1.156	.003

Table (3) shows that there is a statistically significant effect of "effect of technology on design and manage projects of building constructions" which is the level value (.003) of the domain, a statistically significant value at the significance level of (.005). The beta value (1.156) that reflects the degree of the technology effect on design and manage project and thus, the null hypothesis is rejected and there is acceptance of the hypothesis, which says that, there is effect of the technology on design and manage project of building constructions.

- 4.2 **Results related to the second question**, which is "Is there effect of technology on improving communication and Completion during project of building constructions?"

A linear regression of the field was obtained and Table (4) shows the results

Field	R value	R square	Sum of squares	B value	significance level
Effect of technology on improving communication and Completion during project of building constructions.	.658 ^a	.433	27.57	1.35	.001

Table (4) shows that there is a statistically significant effect of "the effect of technology on improving communication and Completion during project of building constructions" which is the level value (.001) of the domain, a statistically significant value at the significance level of (.005). The beta value (1.35) that reflects the degree of the technology effect on improving communication and Completion and thus, the

null hypothesis is rejected and there is acceptance of the hypothesis, which says that there is effect of the technology on improving communication and Completion during project of building constructions.

4.3 Results related to the third question, which is: “Is there effect of technology on improving requirements and problems of project of building constructions?”

A linear regression of the field was obtained and Table (5) shows the results.

Field	R value	R square	Sum of squares	B value	significance level
Effect of technology on improving requirements and problems of project of building constructions.	.472 ^a	.222	14.155	1.166	.000

Table (5) shows that there is a statistically significant effect of “effect of technology on improving requirements and problems of project of building constructions” which is the level value (.000) of the domain, a statistically significant value at the significance level of (.005). The beta value (1.166) that reflects the degree of the technology effect improve requirements and problems of the project and thus, the null hypothesis is rejected and there is acceptance of the hypothesis, which says that there is an effect of the technology on improving requirements and problems of project of constructing buildings.

4.4 Results related to the fourth question, which is “Is there effect of technology on improving speed of Completion of a projects of building constructions?”

A linear regression of the field was obtained and Table (6) shows the results.

Field	R value	R square	Sum of squares	B value	significance level
effect of technology on improving speed of Completion of a project of building constructions	.517 ^a	.267	17.010	1.890	.000

Table (6) shows that there is a statistically significant effect of “effect of technology on improving speed of Completion of a project of building constructions” which is the level value (.000) of the domain, a statistically significant value at the significance level of (.005). The beta value (1.890) that reflects the degree of the technology effect on improving speed of Completion of a project and thus, the null hypothesis is rejected and there is acceptance of the hypothesis, which says that there is effect of the technology on improving speed of Completion of a project of building constructions.

4.5 Results related to the fifth question, which is “Is there effect of technology on improving cost of project of building constructions?”

A linear regression of the field was obtained and Table (7) shows the results.

Field	R value	R square	Sum of squares	B value	significance level
effect of technology on improving cost of projects of building constructions	.319 ^a	.102	19.980	1.040	.004

Table (7) shows that there is a statistically significant effect of “effect of technology on improving cost of projects of building constructions” which is the level value (.004) of the domain, a statistically significant value at the significance level of (.005). The beta value (1.040) that reflects the degree of the technology effect on improving cost of project and thus, the null hypothesis is rejected and there is acceptance of the hypothesis, which says that there is effect of the technology on improving cost of project of building constructions.

4.6 Results related to the sixth question, which is “Is there effect of technology on improve Sustainability of project of building constructions?”

A linear regression of the field was obtained and Table (8) shows the results.

Field	R value	R square	Sum of squares	B value	significance level
Effect of technology on improving Sustainability of project of building constructions.	.411 ^a	.169	10.775	1.775	.000

Table (8) shows that there is a statistically significant effect of “effect of technology on improving Sustainability of project of building constructions” which is the level value (.000) of the domain, a statistically significant value at the significance level of (.005). The beta value (1.775) that reflects the degree of the technology effect on improving Sustainability of project and thus, the null hypothesis is rejected and there is acceptance of the hypothesis, which says that there is effect of the technology on improving Sustainability of project of building constructions.

Chapter five

Discussion and Recommendation

5.1 Discussion

Discussion the results:

1. Discussing the result of the first question which is “Is there effect of technology on improving design and manage projects of building constructions?”

The result of the first question is that there is a statistically significant impact of “effect of technology on design and manage projects of building constructions”, and the scholar denotes it to the fact that the technology has a positive impact on indorsing environmental sustainability on design and project management of constructing, in addition to technological innovations significantly assist in allocating new investment prospects, along with the expansion of the project of constructing, and eliminating the effort, time, as well as cost.

2. Discussing the result of the second question which is “Is there effect of technology on improving communication and Completion during project of building constructions?”

The results of the second question indicated that there is a statistically significant impact of “effect of technology on improving communication and Completion during project of building constructions”, and the scholar denote it to the positive impact on communication and project completion of constructions, and its expedition of communication and the accomplishment of project, and eliminating the concrete time to finish the project with flawless outcome.

3. Discussing the result of the third question which is “Is there effect of technology on improving requirements and problems of project of building constructions?”

The Results of the third question indicated that there is a statistically significant impact of “effect of technology on developing necessities and concerns of project of constructions, and the scholar denotes that to its positive impact on developing the necessities and concerns of project of constructing, in addition to the fact the it donates to decision- making and resolve the problem speedily. There is satisfactory knowledge of current concerns and obstacles too, besides there are an ability of competently communicate.

4. Discussing the result of the fourth question which is “Is there effect of technology on improving speed of Completion of a project of building constructions?”

The result of the fourth question is that there is a statistically significant impact of “effect of technology on improving speed of Completion of a project of constructions”, and the scholar denotes its positive impact on haste of completing a project, and then there is eliminating the time and effort through the use of technology, hence the project is accomplished with less time, the seamless utilization of infrastructure, as well as human resources.

5. Discussing the result of the fifth question which is “Is there effect of technology on improving cost of project of building constructions?”

The result of the fifth question indicated that there is a statistically significant impact of “effect of technology on improving cost of project of constructions”, and the scholar denotes that to its positive impact on developing cost of project of constructing, and it donates to eliminating the amount of waste which is resultant from construction processes, and this is reflected positively on the economic returns of the organization.

6. Discussing the result of the sixth question which is “Is there effect of technology on improving sustainability of project of building constructions?”

The results of the sixth question indicated that there is a statistically significant impact of “effect of technology on improving sustainability of project of constructions”, and the scholar denotes that to its positive impact on developing Sustainability for construction project, and it relies of contemporary methods in order to save the power and generating it, besides recycling it through the use of contemporary resolutions that is connecting to solar power, as well as Renewable energy sources and all

of the residual are depending on applying technology in projects of constructions.

5.2 Recommendation

- 1- Must comprise information about what makes use of what is useful from the workers' technological capabilities, how employees cope with their colleagues, the odds for progressions on their professions and how they are influenced by working circumstances.
- 2- Interest of applying technology in constructions to preserve the sustainability of the atmosphere as well as resources.
- 3- Train workers on using technology which is reflecting positively on the economic returns of the organization.

References:

- Construction Training Fund (2014) **The Impact of New Technologies on the Construction Industry**, the government of Western Australia
- Kang, Y., O'Brien, W., Dai, J., Mulva, S., Thomas, S., Chapman, R., and Butry, D. (2013). "Interaction Effects of Information Technologies and Best Practices on Construction Project Performance." **J. Constr. Eng. Manage.**, 10.1061/(ASCE)CO.1943-7862.0000627, 361-371.
- Khatatbeh Ahmed A., (2015) The Effects of Building Information Modeling on Construction (Productivity and Cost), **Journal of Information Engineering and Applications** www.iiste.org Vol.5, No.7, 2015
- Sargent, Kimberley Hyland Paul, Sawang Sukanlaya (2012) Factors influencing the adoption of information technology in a construction business, **Construction Economics and Building** VOL 12, NO 2
- Sepasgozar, Samad M E, Mohamad Ahmadzade Razkenari, and Khalegh Barati. "The Importance of New Technology for Delay Mitigation in Construction Projects (2015): " **American Journal of Civil Engineering and Architecture** 3. 1. 15-20.
- Shelke Samadhan , and Bhangale Pankaj (2013) Information Technology Training for Construction Industry, **International Journal of Innovative Technology and Exploring Engineering (IJITEE)** ISSN: 2278-3075, Volume-3, Issue-5

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