Effect of Smart Software on Developing The Architectural Projects in Jordan

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Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

Abstract: This research aims at investigating impact of using smart software on developing the architectural projects in Jordan.
To achieve objectives of the research, the researcher used the quantitative research method to extract percentages, standard deviation, and frequencies.
The main instrument used for collecting the primary data was the questionnaire, while secondary data was collected by referring to the previous studies that have addressed the use of smart software in the architectural projects.
Study population consisted of design engineers in the construction firms in Jordan, while research sample has been selected through the use of the simple random sampling technique which consisted of (150) design engineers.
Responses of the engineers to the questionnaire's clauses were analyzed using (SPSS) software.
Based on the results, it is recommended:
- The necessity for learning from the experience of the developed countries in using the smart software to be able to improve and develop the work environment in the architectural projects.
- The need for executing architectural projects through the use of smart software to reach big projects relevant to the society.
- The need for conducting more studies about the smart software and linking them with other variables

Keywords: Smart Software, Architectural Project, Design Engineer.

1. Introduction

In the construction industry there is the need for improving the construction of the architectural projects through the adoption and usage of innovative software's and information and communication technologies to help in increasing the client satisfaction by reducing the coordination and the design errors by providing greater understanding among project participants.

In the architectural projects, there is the need for handling issues and requirements in order to achieve better efficiency by building smart software's (Vasista & Abnem 2018).

Architectural projects are facing several challenges that must be considered such as understanding how one decision will impact other decisions in other areas.

From this stance came the importance of exploring and describing the use of smart software's and their application in the architectural projects.

Furthermore, it is of crucial importance to continuously assess the potential benefits and difficulties of adopting smart software in the construction domain.

Researchers have indicated at the necessity for the construction industry to adopt and employ the up-to-date software for improving design efficiency, and solve different problems that might emerge in the design process (Oad, 2016).

The construction industry is characterized by it highly fragmented and competitive environment (Kalinichuk, 2013).

As a result, majority of the architectural projects are hardly dealt with without communication facilities and information transfer, and currently the architecture, engineering and construction firms are showing great interest in accepting and employing new technologies including smart software to achieve visualization, data analysis, information sharing, communication and collaborative activities (Thomassen, 2011).

The use of such smart software no doubt will increase clients' satisfaction, better efficiency by making a building smarter, comfortable and safety (Intel, 2015).

1-1 Research Problem:

Research problem stems from the apparent lack of sufficient use of smart software by the architectural engineers in the construction companies operating in the Jordanian context.

1-2 Research Questions:

From the statement of the problem emerge the following questions:

1. What is the degree of using smart software in the architectural projects?
2. What are the challenges facing the usage of smart software in the design process of architectural projects?
3. What are the expected benefits from using smart software in designing the architectural projects?

1.3 Objectives of the Research:

Objectives of the research include the following:

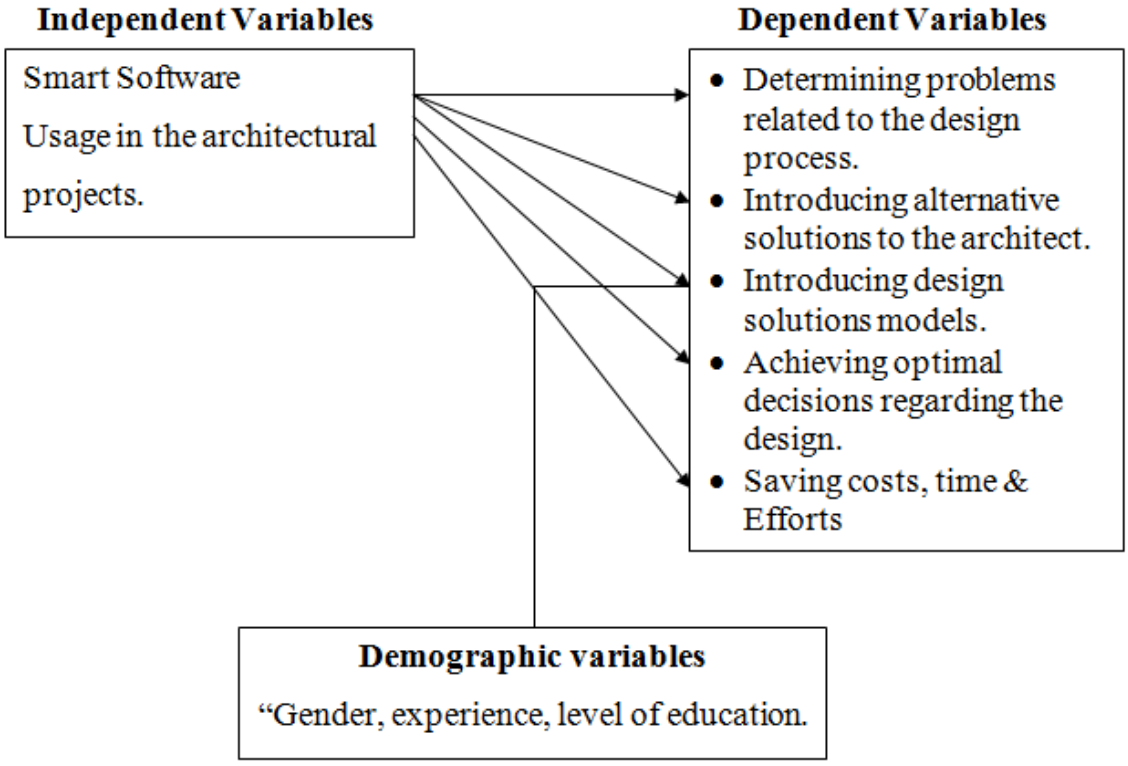
- To determine the degree of using smart software in the architectural projects in Jordan.
- To shed the light on the challenges facing the usage of the smart software in the architectural projects.
- To clarify the expected benefits from using smart software in the design of the architectural projects.

1-4 Significance of the Research:

Significance of the research represents in two sides:

1. **Theoretical side**: Through presenting concepts and insights to the architectural engineers about the importance of including the smart software in their work to achieve the optimal results in the design process of the architectural projects.
2. **Practice side**: Results of this research might positively contribute to provide valuable concepts to the construction firms about the importance of employing smart software in the design process.

1-5 Model of the Research:



1-6 Hypotheses of the Research:

Ho: There are no effects with statistical significance at significance level (α=0.05) of using smart software on the design project of the architectural projects.

H1: There are no differences with statistical significance at significance level (α=0.05) of using smart software on the design project of the architectural projects attribute to the architect's demographic variables (gender, experience and level of education).

1-7 Limitations of the Research:

This research is limited to the follow:

- It is limited to its topic "Effect of smart software on developing the architectural projects in Jordan.
- It is limited to the architectural engineers.
- It is limited to the construction companies in Jordan.

2- Theoretical Framework:

While the use and adoption of innovations such as smart software and the advancement in information and communication technologies have the potential to add value to the construction industry, still may have negative impacts such as forces to reform old organizational forms and practices, they also may become threat to the firms if not used, since they require specific tools, rules and discipline (Barrett & Sexton, 2006).

Construction firms are facing barriers in adopting and implementing smart software because they require high cost of investment, system malfunction, virus attacks and high cost of professionals to employ (Mutesi & Kyakula, 2011).

According to (Motta., Oliveria & Travassos, 2018), contemporary software systems are new technology paradigms bringing challenges for their construction and usage, leading to a shift from the classical view of development to software systems materialized through physical objects interconnected by network and with embedded software to support daily tasks and activities, requiring knowledge about the software and their development (Gubbi, et al, 2013).

(Casale et al, 2016) study aimed at indicating that the adoption and implementing information and communication technologies, in particular the use of software, is more pervasive, and cannot be any more considered as a minor element of a complex system, and the need for consolidate the software engineering discipline as one of the youngest scientific and technological discipline affecting our life, the services that can be exploited in different domains.

Kettunen & Makitalo (2019) have indicated in their study that has addressed important issues regarding what particular software competencies and qualities are required to develop and utilize systems software applications through improving software capabilities in the different business domains.

Furthermore, the researchers have shed the light on the meaning of software as all ICT based intangible infrastructure elements and ICT enabled solution artifacts requiring knowledge, skills and expertise to define, design and implement software for developing, acquiring and using software operationally.

3- Methodology of the Research:

3-1 This present depends on the quantitative research method because of its relevance to conduct this kind of research by enabling the researcher to extract the means, standard deviations and frequencies.

It is a descriptive analytical method to address the topic under study by referring to the previous related studies, and analyzing the extracted data from the study sample individuals.

3-2 Study population and sample:

3-2-1 Study Population:

Study population consists of architects working in the construction companies in Jordan.

3-2-2 Study sample individuals:

Because of the big number of architects working in the architectural field, the researcher has resorted to the simple random sampling technique by (50) male and female respondents to participate in the research, (30) males, and (20) female engineers.

3-2-3 Sources of Data Collection:

The researcher has resorted to two sources for data collection:

- Secondary data was collected from the previous related studies.
- Primary data- primary data was collected through the use of the questionnaire prepared by the researcher.

3-3 Scaling:

After formulating the questionnaire in its final form, the researcher used Likert scale with consists of five orders to gauge the views and responses of the study sample individuals to the questionnaire's clauses.

Giving the following scores:

(5) Scores to strongly agree.

(4) Scores to agree.

(3) Scores to neutral.

(2) Scores to disagree.

(1) One score to strongly disagree.

3-4 Statistical Treatment:

The following statistical treatments were used through the application of the statistical package for social science (SPSS) software to extract: Frequencies, percentage, standard deviations, and means.

- Reliability: through the use of Cronbach's Alpha Coefficient, and correlation Pearson Coefficient.

4. Statistical Analysis:

Results of the Study:

Following is illustration of the study results and their discussion in addition to the main recommendations.

First: Results of the study and their discussion:

*** Testing The Hypotheses:**

Testing the first primacy hypothesis which states "there is no effect with statistical significance at significance level (α=0.05) of using smart software on developing the architectural projects".

To answer this hypothesis, the multiple regression analysis was used, it results represent in table (1).

Table (1) Results of the Multiple Regression Analysis

Correlation	Determination Coefficient	(F) Value	Significance
0.969	0.485	8.473	0.000

Table (1) shows that correlation coefficient reached (0.969) and the statistical value (F) reached (8.473) at significance level (α=0.05), and this indicates that the determination value reached (0.485). this indicates that (0.485) of the variation in the dependent variable explained the independent variable which means the presence of effect with statistical significance at significance level (α=0.05) of using the smart software on the development of the architectural projects.

This can be explained through that using the smart software helps in the design of the architectural projects, since the smart software's contain all the tool that help in the design and development of the architectural projects with standard specifications at less time and effort.

Results of analysis the second Hypothesis which states "There are no differences with statistical significance at significance level (α=0.05) of using the smart software in the development of the architectural projects attribute to demographic variables.

1. Gender:

T-test was used to extract the differences significance attribute to gender through table (2).

Table (2) Results of T-test for the Differences Significance Attribute to Gender

The Field	Gender	Number	Means	S.D	T	Significance
Smart software usage	Males	100	3.13	0.67	-0.29	0.77
	females	50	3.16	0.72	0.89	0.38
Total degree	Males	1`00	3.26	0.58		
	Females	50	3.17	0.66		

Table (2) shows that the differences between the arithmetic means did not reach level of the statistic significance at significance level (α=0.05), so there are no differences with statistical significance at significance level (α=0.05) of using smart software in the design and development of the architectural project attribute to gender.

This can be explained through that the sample individuals agree about the clear positive effect of using the smart software on the design of the architectural projects and delivering high quality projects satisfying the development that has touched all life's fields.

Experience:

To answer this hypothesis, t-test was used to extract the differences significance attribute to year of experience.

Table (3) T-test results of the Differences Significance attribute to the variable years of Experience

The Field	Years of Experience	Number	Mean	S.D	T	Significance
Experience in using the smart software	Less than (5) years	60	3.15	0.66	0.65	0.52
	More than (6) years	90	3.09	0.65		
Total degree	Less than (5) years	60	3.12	0.77	0.63	
	More than (6) years	90	3.14	0.55		

Table (3) shows that the differences did not reach level of the statistic significance at significance level, which means there are no differences with statistical significance at significance level (α=0.05) in using smart software on the design process of the architectural projects.

It is possible to explain that the sample's individual regardless of their experience do not differ about the presence of importance of using the smart software which significant role in developing the process designing the architectural projects and delivering them with global specification.

Educational Level:

To answer this hypothesis, (t-test) was used to extract differences significance attribute to education level.

Table (4) Results of (t-test) to Extract The Differences Significance attribute to education level variable

The Field	Level of Education	Number	Mean	S.D	T	Significance
Smart software usage	Bachelor	120	3.17	0.55	0.70	0.60
	Master	20	3.15	0.56		
	Doctorate	10	3.12	0.74		
Total degree	Bachelor	120	3.10	0.64	0.72	
	Master	20	3.14	0.44		
	Doctorate	10	3.19	0.65		

Table (4) shows that the differences did not reach level of the statistical significance, since (t) value reached (0.70-0.72). So, there are no differences with statistical significance at significance level (α=0.05) in using smart software on the process designing the architectural projects attribute to educational level.

It is possible to explain that through the sample's individuals regardless of their scientific qualification agree about importance of using the smart software in developing the architectural projects to follow-up requirements of the modern era.

5. Conclusion:

Based on the results, the following conclusions were reached:

1. There is an effect with statistical significance at significance level (α=0.05) of using the smart software on developing the architectural projects.
2. There are no differences with statistical significance at significance level (α=0.05) of using the smart software on the process of developing the architectural projects attribute to gender.
3. There are no differences with statistical significance at significance level (α=0.05) on the development of the architectural projects attribute to years of experience.
4. There are no differences with statistical significance at significance level (α=0.05) on the development of the architectural projects attribute to educational level.

Recommendations:

Based on the results, the researcher recommending the follow:

- The need for benefit from the technological developments especially in the field smart software in designing and developing the environment of the architectural projects within standard specifications.
- The necessity for learning from the experience of the developed countries in using the smart software to be able to improve and develop the work environment in the architectural projects.
- The need for executing architectural projects through the use of smart software to reach big projects relevant to the society.
- The need for conducting more studies about the smart software and linking them with other variables.

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