

Evaluating the effectiveness of computer software on architectural design

Vahid Alaeddin¹, Azadeh Esmaeili Sales¹, Ali asghar Sepehrifar², Faezeh Biklari²,
Golnesa Honarvar¹

1. Mirdamad Higher Education Institute, Gorgan, Iran
2. Department of Architecture, Gonbad Kavous branch, Islamic Azad University, Gonbad Kavous, Iran

ABSTRACT: This paper examines the impact of architecture software of trend designing the architectural engineering; despite software, can we help to designing and engineering of architecture? Answering this question, five of software and several papers related to the virtual world have been studied; the various researchers say that each software have its own application. Drawing and designing software of the architecture called sketch up, Architect, 3D max, Revit and Catia software are that have been compared in this article. For each of these applications after reasonable inquiry and investigation, we have reached the conclusion that in terms of quality and modeling, software of 3D max, Catia are the best and of drawing precision, software of Revit and Architect and of speed, software of sketch up; of course any software has capabilities of its own, and each used for a special project.

Key words: software, Computer, Architectural Design, 3D max, sketch up.

INTRODUCTION

Large systems get often broken into sub-systems that provide a set of services related together. The primary process of design to identify the sub-systems is called architecture design and output of this process would be descriptive design of the software architecture. Software architecture offers a high-level abstraction of software systems in the form of elements, interfaces, coarse-grain processes and their configure (Sommerville, 2006). Indeed, the software architecture describes organizing software systems, using components, interfaces and configuration, thereby the components and interfaces can be connected in a system, and the data which is transferred between components and interfaces. The architectural design would be the first step in the design process and makes an important link between design and engineering process of requirements. The architectural design process deals with creating a structural framework of basis. The system architecture is effective on performance, capability, distribution capacity, reliability and maintainability of system, the structure and the style that is selected for the system may depend on the non-performance wishes of systems. There are a large overlap between the engineering processes of requirements and architectural design. Ideally, system's profile should not contain the design information. In practice, this situation does not happen except for very small systems. Architectural analysis would be necessary to structuring and organizing the specifications. The design of the sub-system is of an abstract analysis of the system to the parts are greater, so that each can be accounted for a system. Block diagrams are usually used to describe the design of the sub-systems and each square on the chart represents a sub-system. General issue is a decision on how to break down a system into subsystems to be difficult. Of course, the requirements of the system would be the most important factor and must create a design to have a close match between the requirements and subsystems. This means that if requirements to be change, they will be local changes but not distributed in the area of sub-systems. It is difficult to evaluate an architectural design, since completely testing architecture is meant to determine how to meet the functional and non-functional requirements, after being developed. The main focus is on software development, because the architectural models could recognize and represent formally structural, behavioral and hybrid-complexity aspects of the software, as they offer precise arguments on features overall system. But in addition to understanding the general characteristics which aims to understand the architectural solution, an engineering approach requires the development of models and theories to solve the problems become repeated. These models and theories

lead to the development of successful experiences that can be applied to solve similar problems (Sommerville, 2006).

1-1 Theoretical evaluation of software architecture concepts

Each of the articles provides a specific definition of architectural software that based on field of study and research need carried out different interpretations. However, there are many common points and differences between concepts of architecture software at these articles. The first article expressed in the software application of architecture design and designers depict the diagrams to think about the architectural idea and design relationship. On the other hand, computer scientists and engineers are also interested to design and plan computers for interpreting and recognizing diagrams and drawings for architectural (Anandarajan, 1998). What another article stated theoretically is that the impact of software Sketch up on process of drawing Esxis of architecture, that the methodology of the research would be pilot - survey. Three methods of drawing Esxis and architectural schemas with computer tools (software sketch up), with hand tools and using a combination technique (handy and computer) as the most main conceptual design activities are considered. On the statistical population, the researches were compared with each other. To analyze the data resulting from the study, average scores of students' Esxis by jury, factor analysis of the questionnaire and statistical test of multiple analyses of variance, ANOVA were used. The results achieved showed the Esxis Group using hand tools (paper and pen and clipboard) reached the highest scores. Therefore, it was seen the software sketch up cannot be still considered as a good alternative for hand tools in the early stages of the design process (HashemiNejad, 2013). Another article examines how to behave the research of software architecture design currently, which brings the development of information systems (ISD) and forward argues about the nature of architectural design and its impact on the selection and use of system development. Architecture guides ISD Group on the target system and offers models that can be used as a first-class model; and structure of engineering analysis and design requires to dynamic engineering of method and tool to flexible modeling with architectural design the needfor future research efforts was mentioned (Smolander, 2002). Another article says, computer-aided design and manufacturing process can play a very important role in a wide range of scientific and industrial activities today such as architecture, industrial design, civil engineering and mechanical engineering and industrial engineering. By such a way, the architects can draw and embody in real-time the facts virtually. Digital architectures help designers and architects to virtually create real structures so that they can move the inner space before building and implementing a plan and examine all conditions. The computers can provide design of virtual space before creating the reality and also producing using visualization and simulation to be possible. This study examines virtual space and its impact on architecture and urbanism (M, 2009). In another article it was stated that software Architect has a considerable impact in the process of architectural design, there are also other software that exert this influence on the process of architectural design. The designer by using software Architect when designing can look at horizontal, vertical cutting, three-dimensional view and volume at the same time and this help us to visualize some of the space not to be seen, correctly (Soltanpour, 2011). Another article said that the impact of MS Project software on the architectural design process with regard to project management can have a large impact. MS Project software will classify time for project execution for us so when designing software architecture we can use MS Project and divide the time on all parts of the project; and this time limited us during the design process and makes it possible an architect have more or less time to gather studies. And this time will have a significant impact on the design process (panterz, 2012). In an article, it confirmed the effect of 3D max software on architecture design, and according to research, it has reached the conclusion that 3D max software show the real and natural materials and helps designers, while designing, see different view other than a three-dimensional volume as well as see a view of the future projects ahead of implementation. This allows the designer to better understand the size of self-building; that is what is designed and shown implements exactly (piternina, 2010). Checking Catia software of architecture design, the article mentioned that the Catia software because of so strong model can be considered one of the fastest softwareof the architecture, and high speed as well as powerful modeling helps the designer better able to understand their plans and examine several projects in less time. The higher the number of projects, the more open the designer's thought (dirbas, 2011). Another Software Revit has significantly impacted on architectural design; Revit is high-power computer software in the field of modeling, as well as good quality materials for better visibility into actual buildings. In this study, the researcher mapped the speed of the operator's depiction by application Revit, finally

come to the conclusion that high speed Revit has led designer does several designs at the same time, instead of designing one plan (libarsima, 2009).

Table 1: An overview of the history of architectural software

Author	Date of publication	Purposes and comments to the architectural software
Anna Dorajan	1998	Designers to think about the architectural idea and design relationship attempt to depicting the diagrams
Hashemnezhad	2013	Impact of software sketch up on architectural Esxis drawing process and finally drawing by hand and clipboard is better than software sketch up
Smoulendar	2002	Design analysis is about the need for dynamic engineering of methods and tools to flexibly modeling with architecture design (ISD)
Manoucher	2009	Computer-aided design and production process can help in a wide range of architectural, Computers can provide design in virtual space before the reality created and also production using mental visualization and simulation
Soultanpour	2011	Software Architect to help architect the same time to see and visualize all aspects of the design
Panters	2012	MS Project software during the process of architectural design makes architect make a better study and design within scheduled and knowing the time
Peternia	2010	The impact of software 3D max architecture on the architectural design to reveal the real and natural materials causes a architect to see the design with reality of its advantages and disadvantages.
Diyer Bass	2011	Software Catia because of very strong and high-speed modeling help designer works better
Libar Sima	2009	Revit is high-power computer software in the field of modeling, as well as with good quality materials for better visibility into real buildings

2-1- An applied review of architecture software

Software Architect helps an architect see all aspects of design simultaneously and visualize. Other Software like Software Architect is software 3D max, its impact on architectural design is that revealing natural and real materials, it causes an architect observes her/his plan with real advantages and disadvantages. Another study suggests that computer-aided design and production process can help in a wide range of architecture; the computers can provide to design in virtual space before creating the reality and production by using mental visualization and simulation. As is said in the previous article the need for dynamic engineering analysis of methods and flexible modeling tool with architectural design (ISD), the two types of papers, both influence on the architecture. We can say that whatever the design is done more virtually and computerized, the quality goes up. Designers to think about the ideas of architecture and the design relationship draw the diagrams. Another application called sketch up like software Architect, 3D max, Catia is of powerful modeling and materializing; the article has investigated Esxis concluded that we can best get to the design with free hand. What sketch up application has an impact on drawing process of architectural Esxis is that the Esxis drawn by hand and clipboard is better than by sketch up. This application is capable of object making and materializing. Another application studied by the researcher for architectural design would be application Catia, and this for the powerful and speed modeling helps designer confirm him/herself design of different models at last the combination of several models. The application Catia is of great power in the field of modeling, particularly the designer wants to create the curves and arches within. Revit other application like Catia, which is of high-quality materials as well as high modeling. Revit would be able to design the false ceilings in the building from several ready designs to give the designer; as well many objects in this application are clear. The advantage compared with others is that when drawing up and finishing the design it complies with operation of the meter by itself. The architectural applications in general work at the same way, but their performance varies in terms of quality and speed with each other. The common between them is architecture of materializing and modeling and high functionality for all the architectural application is that we can see different views and dimensions at a time. As mentioned at first, the application Architect is a high speed one because all objects of this are available as well as doors, walls, windows, stairs, etc. located within the software to help designers quickly map to their own plan. As a result, it can be said that the application Architect, when modeling, puts the intended material into the bulk in contrast to other applications, they build initially empty bulk and later the material is chosen. The architectural applications help architect to implement the high quality plan in less time. Another application called MS Project in the process of architectural design makes the architect over scheduled duration according to the knowledge of time can make a better study

and design; unlike others this is not able to designing and materializing. Its ability is linked to the project management and duration of implementation of the project.

3-1- Reviewing the strengths and weaknesses of each of the architectural applications

The strengths of drawing the table of the process of architectural design makes designer to divide the design and use the factors will affect. The table makes a designer at a glance see several issues or several pages of a table and this action causes the planner to think and analyze further. The weakness of the table for the designer is that some important cases cannot be found in the table and they have an impact on the design process. Another application called sketch up in architecture has led the designer can see oneself as an Esxisy and hands-free, and this makes designers access to some of the movements when designing. It can be said that the application sketch because of speediness and simplicity it has, a designer can see the project in a short time. It has a weakness in the field of materials' quality, which is possible the designer when viewing the plan cannot see some things while they should exist in real and it leads the plans to be change. The quality of design is very important. Another application called Architect has benefits in terms of objects that are the applied and ready objects available within the application. It can be said that this has other features when designing two-dimensional plan, three-dimensional inevitably is drawn to us, and it is of very high speed one in mapping. And the designer can easily in a short time change several the interior decoration projects, another benefit of this application is that it gives index, horizontal cutting, vertical cutting, perspective of view of bird observers to us at the same time and also the designer draws a wall at the same time the wall material of the wall is clear and obvious. But the weakness is that the quality of the object is low. Another application called 3D max has many functions to the architecture that is one of the best known over the world. This is an advantage to having excellent qualities and that makes the designer see the actual plan. But the weakness is that this application has a low speed and designer cannot do in the shortest time the original plan with lower quality. Another application called Catia is the same as 3D max that, in the modeling, is stronger than 3D max. The application Catia has poorer materials compared with 3D max, however, better quality than other software. Another application called Revit, works like the two previous applications, has the benefits of being higher speed in the interior design than others; another is that it makes the plan meter for us and delivers it packaged. The weakness is that it is a lot of time of rendering, the application Revit works like AutoCAD software, but is more advanced in the three-dimensional drawing.

4-1- Methodology, population, sample size, data collection method

The purpose of this paper is to evaluate the effectiveness of computer software developed in the architectural design. Similarly, in order to operationalize this in the article, the combined approach is used to scrutiny. This combined is defined generally both quantitatively and qualitatively. The combined approach in this study is based on survey and documentary methods. The documentary method is used to collect information in the field and assess functionality, the strengths and weaknesses of each of architectural software. To improve the quality and accuracy of the study as a survey and via a questionnaire of 38 specialists who deal with this software, information was collected. Each of these experts has different and sometimes the same perspective to the software.

5-1 The results of the questionnaire

According to the inquiry conducted in this study, it is achieved the following information.

Table 2: The speed level of software

Application	The speed level of software				
	Very High	High	Medium	Low	Very low
Sketch up	56%	22%	12%	7%	3%
Architect	36%	38%	18%	8%	0
3D Max	17%	5%	30%	35%	13%
Catia	16%	24%	36%	13%	11%
Revit	25%	13%	28%	20%	14%

Table 3: The quality of the software

Application	The quality of software				
	Very High	High	Medium	Low	Very low
Sketch up	8%	12%	18%	42%	20%
Architect	18%	23%	36%	23%	21%
3D Max	71%	23%	8%	0	0
Catia	65%	33%	8%	0	0
Revit	43%	32%	25%	0	0

Table 4: The software modeling level

Application	The software modeling level				
	Very High	High	Medium	Low	Very low
Sketch up	12%	9%	63%	7%	9%
Architect	3%	11%	73%	3%	11%
3D Max	56%	32%	13%	9%	0
Catia	66%	28%	6%	0	0
Revit	18%	24%	42%	13%	3%

Table 5: the software accuracy

Application	The software accuracy				
	Very High	High	Medium	Low	Very low
Sketch up	11%	23%	48%	13%	5%
Architect	8%	22%	38%	18%	14%
3D Max	68%	24%	8%	1%	0
Catia	31%	27%	14%	15%	13%
Revit	15%	43%	28%	14%	0

Table 6: The level of the software object making

Application	The level of software object making				
	Very High	High	Medium	Low	Very low
Sketch up	7%	7%	56%	23%	7%
Architect	7%	18%	46%	22%	7%
3D Max	78%	22%	0	0	0
Catia	63%	23%	14%	0	0
Revit	59%	21%	20%	0	0

6-1- Conclusion

The study came to the conclusion that the five of software got evaluated in terms of quality, speed, object making, modeling and drawing accuracy that sketch up in terms of speed has the highest rate among them, and the lowest rate belongs to 3D max. And the quality, 3D max is of the highest quality and lowest quality to sketch up. In terms of the drawing accuracy, Revit and 3D max are equal and have a higher accuracy than others, but the Software Architect is of lower drawing accuracy than others. In terms of modeling, Catia is the best software and after that 3D max is better and Software Architect is one of the weakest. In terms of object making, 3D max is the best and Software Architect, the worst. Finally, it can be concluded, when the designer wants to present a quick and initially sketch to the employer, s/he would better apply the Software Architect sketch up, but at the end, waning to finalize the design Catia and 3D max would be better. Especially when the designer has a special plan in mind and modeling can only be done with software Catia, Catia software can be used.

RESOURCES

- H.Hashemnezhad (2013), "The effect of software Sketch Up on the process of architectural Esxis drawing" Publication: Research center for architecture and urbanism. Page 29-38.
- F. Sultan Pour, (2011), "Effects of Software Architect in architectural design. Publication: Research center for architecture and urbanism. Page 65-74.
- R.Manocher (2009), "Cyberspace and its impact on the architecture" Publications: Special Architectural Engineering. Page 72-53.
- K. Smolander, Software Architecture Design in Information Systems Development: A Method Engineering View, 2002, pp. 220-226.
- I. Sommerville, Software Engineering: Architectural design, th,Ed, 2006,pp. 241-245.1.
- M.Anandarajan, B. Arinze, Information & Management: Matching client/server processing architectures with information processing requirements, ELSEVIER, 1998, pp. 266-268.
- H. panterz, Impact on the architecture of software MS Project, 2012, pp. 216-221.
- L. piternina, Effect of 3 D max software architecture and influence the design process, 2010, pp. 284-292.
- J. dirbas, Impact on the Catia software architecture and its influence on architectural design, 2011, pp. 184-189.
- U. libarsima, Revit Architecture software applications in architecture and design, 2009, pp. 164-172.