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Awareness and usage of design software amongst students of Chandigarh College of Architecture

[1]Dr. Jagjiwan Kaur, [2]Mahavir Singh
jagjiwankaur@gmail.com

***Abstract*— The present study was undertaken on students of Chandigarh College of Architecture, Chandigarh. The major objectives of the study were to get an insight into the knowledge and extent of software usage amongst students of architecture and to know about problems related to its usage. The data was collected on a self-prepared questionnaire. Results showed that students used software related to architecture extensively in their curriculum but the knowledge about the available software in the field was limited. Autodesk Autocad was the most popular software .The results indicated that they were not given much orientation or training in the usage by the faculty and majority learnt about the software they were using either on their own or from their seniors. Most of the students expressed their desire to be allowed the usage of these software even in the examinations and submissions. Popularity of pirated versions among students emerged in the analysis. Based on the results, suggestions and recommendations for helping the students for effective usage of software have been made.**

***Index terms*- BIM, software usage, Pirated software versions, Problems of software usage, Software for architecture**

I. INTRODUCTION

The past decade has seen a dramatic growth in the use of computers and software in various fields of education. Computers have been installed in majority of the professional colleges. Even in colleges of architecture and architectural firms, software is being increasingly used for creating and communicating design ideas. In colleges of Architecture, computers are being seen as providing students a tool for efficiently designing, capturing and analyzing design concepts, and more accurately maintaining coordinated and reliable design data through documentation. In some institutions, with the assistance of varied software, students are efficiently and accurately creating and sharing design visions. They are using software to get help in creating and analyzing designs, exploring design alternatives and addressing concerns that arise during project work. Some have even through video conferencing, been able to hear first-hand from architecture firms on how they are solving real-world business challenges and thus design with greater insight and understanding. Today, computers are being used by nearly everyone in the construction industry, be it young and fresh pass outs or experienced professionals. It has become imperative that at the higher education level, students be introduced and encouraged to make use of software relevant in their area of specialization [1]. Software programs have become popular in most Construction Industries and institutions offering Civil Engineering and Building Technology programs. Most higher learning institutions have now equipped their graduates with adequate skills of using computer software programs that can help them in carrying their daily task in the industry [2].

In the past, building design was largely reliant upon two-dimensional drawings (plans, elevations, sections, etc.). Building information these days, however, extends this beyond 3D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension (4D) and cost as the fifth (5D). Software application helps students and architects in this and in analyzing, portraying spatial relationships, light analysis, geographic information, wind and HVAC analysis, quantities and properties of building components.

Extraction of different Perspective views of not just the aesthetics but Building Services from a building model for drawing production and other uses is now possible with the application and use of Building Information Modeling (BIM) software. These also help to define the objects as parameters in relation to other objects, so that if one object is amended, dependent ones will automatically change. BIM software are presently being used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures, from water supply, drainage, electricity, refuse and communication utilities to roads, bridges and ports, from houses, apartments, schools and shops to offices, factories and warehouses etc. BIM covers more than just geometry. For the professionals , BIM enables a virtual information model to be handed from the design team (architects, landscape architects, surveyors, civil, structural and building services engineers, etc.) to the main contractor and subcontractors and then on to the owner/operator. Each professional adds discipline-specific data to the single shared model. This reduces information losses that traditionally occurred when a new team took 'ownership' of the project, and now provides more extensive information to owners of complex structures.

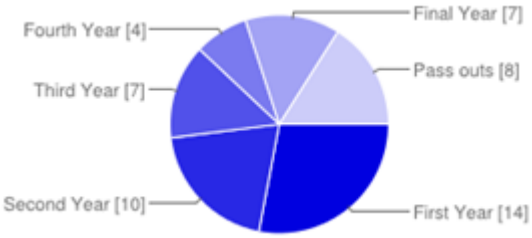
BIM's added features on large is still a relatively new technology in an industry typically slow to adopt change. Yet many early adopters have successfully demonstrated that BIM will grow to play an even more crucial role in building documentation. Green Building is an emerging schema, a

subset of the BIM efforts, focused on green building design and operation.

With the development of modern computer technology, a large number of building energy simulation tools are available. Explorations are underway to pair computer network users' personal, private and public authentication choices, geographic mapping systems and evolving cloud computing security architecture models, together, to offer customers of geospatial securitization services, intuitive new ways to organize their personal, private and public applications and storage.

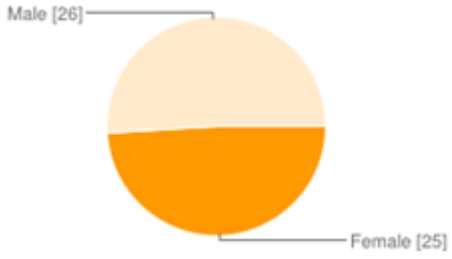
II. METHOD

The design used for this study was that of survey which relied on a self-prepared questionnaire to generate data for the analysis. This study was carried out on 26 Boys and 25 Girls randomly selected from 1st to 5th year of the college. The sampling details are given in Figure 1(a) and 1(b) shown below.



First Year	14	27%
Second Year	10	20%
Third Year	7	14%
Fourth Year	4	8%
Final Year	7	14%
Pass outs	8	16%

Figure 1 (a)-Sampling Distribution



Female	25	49%
Male	26	51%

Figure 1 (b)-Gender Distribution

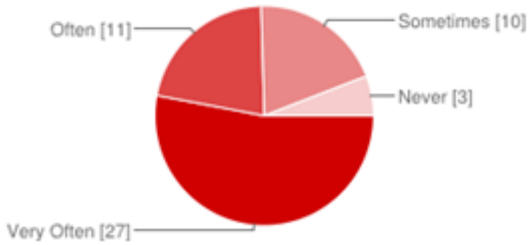
Tool Used for the study

To study the awareness and usage of design software amongst students of Architecture a self-prepared questionnaire was used. The questionnaire consisted of 19 questions (Appendix 1). The questions were both open and closed ended, so that qualitative as well as quantitative analysis of the data was possible. The questionnaire was pilot tested and questions which posed problems or were not properly understood were changed or deleted. The questions were related to demographic characteristics of the respondents, awareness, knowledge and usage of various software, the source of information, training, orientation, problems related to the usage of software, teachers 'awareness and competence in its usage and encouragement given by them, curricular modifications and suggestions of the students. Percentages were calculated, Bar graphs and Pie charts were made for analyzing the data.

III. RESULTS AND DISCUSSION

A. Extent of software usage among students of architecture

As seen in Figure 2(a), 53 % of the students very often used software in architectural learning and curricular transactions. 22 % used them often and 20 % used them sometimes. Only 3% never used software in their workflow, and this minority belonged to First Year. Earlier researches show that extent of software usage is influenced positively by both attitude and self-efficacy. The ease of use influences learners' intentions to use software, whereas their anxiety has negative impact on its use and intentions [5]. Thus orientation and training of students can bring about positive change in attitude and enhance self efficacy of students in use of software.

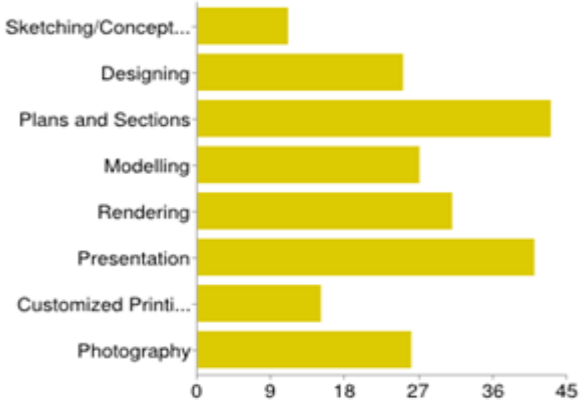


Very Often	27	53%
Often	11	22%
Sometimes	10	20%
Never	3	6%

Figure 2(a)-Usage of architectural software

B. Application of software in different aspects of architecture

The most popular usage of software were in making plans and sections followed by presentations, rendering, modeling photography and designing. This is clearly seen from the bar diagram given in Figure 2(b).



Sketching/Conceptualisation	11	22%
Designing	25	49%

Plans and Sections	43	84%	
Modelling	27	53%	
Rendering	31	61%	
Presentation	41	80%	
Customized/3D/Laser Printing	15	29%	
Photography	26	51%	

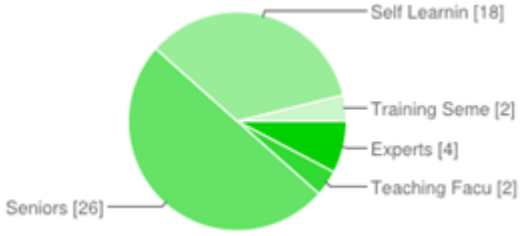
Figure 2(b)-Application of software in different aspects of architecture

C. Source of knowledge related to software

As seen in Figure 3, 51% reported gaining knowledge and skills related to software applied in architecture from their seniors followed by self-study of various software. Only 8 % reported gaining knowledge and skills about software usage and application from experts and surprisingly only 4 % from teaching faculty.

Earlier research reports that teachers' access to resources, quality of software and hardware, ease of use, incentives to change, support and polices, commitment to professional learning and background in formal computer training influence teachers' knowledge, competence and motivation to use software in teaching learning process [3].

So, perhaps efforts on part of teaching institutions and university need to be put to train, motivate and encourage the faculty in making use of software in their teaching. Orientation and training programs must be held from time to time to update the knowledge of teaching faculty related to latest software and newer versions of the old ones as one of the main reasons for students to look upto their seniors for guidance is their extensive knowledge of new features in updated versions of such software.



Experts	4	8%
Teaching Faculty	2	4%
Seniors	26	51%
Self Learning	18	35%
Training Semester	2	4%

Figure 3-Source of knowledge related to software

D. Perceived Popularity of software v/s Actual Popularity of software among students

The most popular software as perceived by students were Autodesk Autocad followed by Rhinoceros, Adobe Photoshop, Trimble Sketchup and Graphisoft Archicad as shown in Figure 4(a).

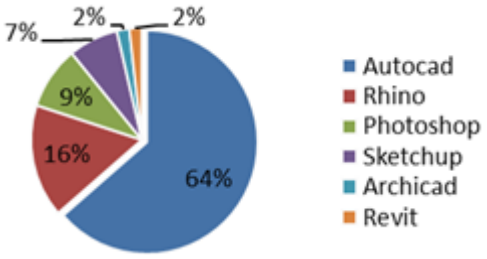


Figure 4(a)-Software perceived as most popular by students

However, the most popular software in terms of proficiency and use by students as shown in Figure 4(b) were Autodesk Autocad followed by Adobe Photoshop, Trimble Sketchup and Rhinoceros, Autodesk Revit and Autodesk 3DS Max

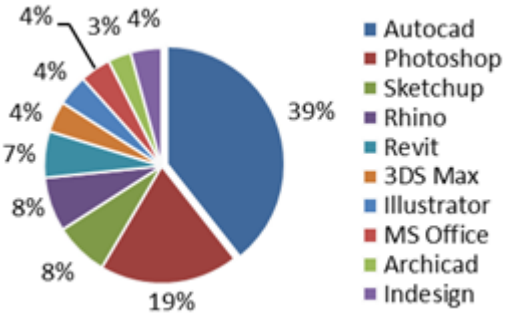


Figure 4(b)-Software used most proficiently

Comparison of the two figures shows that there was variance in perceived popularity of certain software and its actual usage. For example, Rhinoceros was perceived more popular in the college than it actually was. Only 8% of the college strength used it. Thus, its important to get hands on training for actual use of different software rather than being merely influenced by peer group.

E. Awareness of software among students

Majority of the students were familiar with names software such as of Autodesk Autocad, Adobe Photoshop, Trimble Sketchup, Rhinoceros, Graphisoft Archicad, Autodesk 3DS Max and Autodesk Revit as shown in Figure 5.

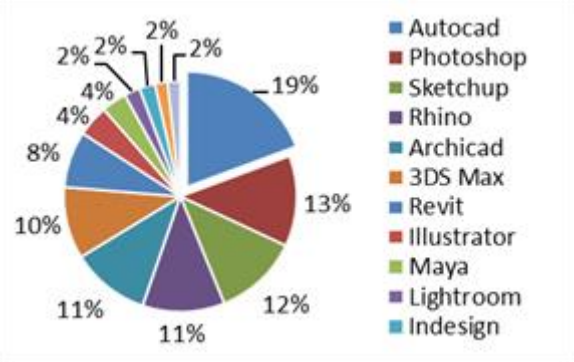


Figure 5-Awareness of various software among students

F. Desire for software Training

Majority of students given a choice wanted training in the use of Autodesk Autocad and Autodesk 3DS Max as seen in Figure 6.

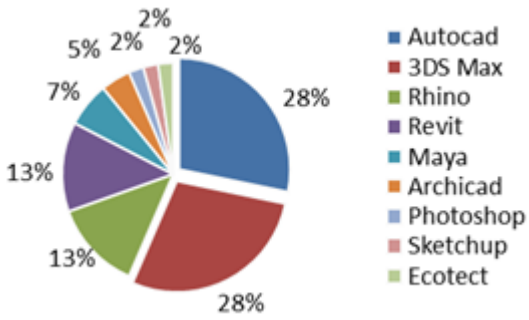
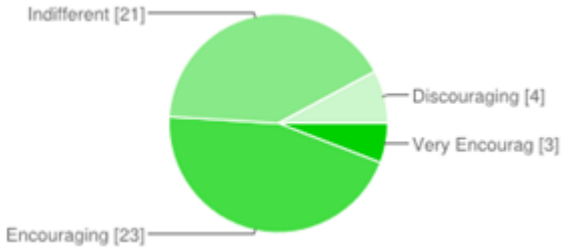


Figure 6-Desire for training in a specific software

G. Perceived attitude of faculty towards usage of software

The opinion of respondents regarding encouragement by faculty on usage of software in architecture was found to be equally divided. 45% found the faculty encouraging while 41% found them indifferent. 6 % very encouraging and 8 % rather discouraging. This indicates that students had varied experience with different teachers who were teaching them. It could also mean the differences in teaching methodology of the faculty and their personal philosophy. Although it is a norm that freshers and junior students are discouraged from using software so that they get experience in doing work by hand so as to develop various skills required of an architect, however when they hear of various software from seniors, they often feel unsure and frustrated about applying and using software for their curricular work. Without a uniform pattern and instructions being followed by the entire faculty, the motivation to learn and use software is likely to come down.

Earlier research studies suggest that teachers' beliefs about teaching and learning with software are central to successful application of software in curriculum [3]. A major discrepancy has been reported in research studies between the level of technology use expected of educators and the actual use and integration of technology in the classroom [4].

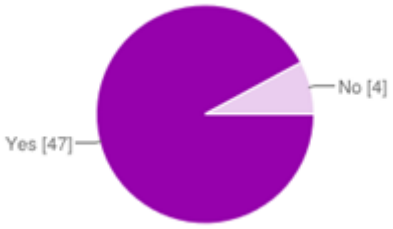


Very Encouraging		36%
Encouraging	23	45%
Indifferent	21	41%
Discouraging	4	8%

Figure 7-Perceived attitude of faculty towards usage of software

H. Inclusion of knowledge and application of Software in curriculum

As seen from Figure 8, almost the entire student population (92%) was keen that trends, awareness and application of Architectural Software should be made part of the curriculum. They were also keen that the teaching faculty should take more interest in usage of software in day to day transaction of curriculum as well as allowing them to use it during examinations.



Yes	47	92%
No	4	8%

Figure 8-Inclusion of Software in curriculum

I. Use of software for student evaluation and examinations

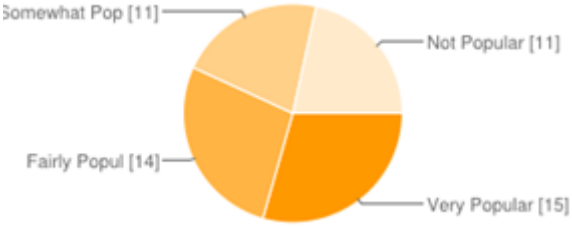
As seen from Figure 9, majority of the students (90%) wanted to be allowed the use of software during examinations. Only 10% felt that it should not be allowed. Today's workplaces make use of Computer drafting and presentation for efficient and clear projections, thus making handwritten material redundant and time consuming. Handwritten sheets generally go in favour of students with better handwriting and drafting skills even though their designs and content might be inferior to others.

Yes	46	90%
No	5	10%

Figure 9-Use of software for student evaluation and examinations

*J.*Popularity and Usage of pirated versions among students

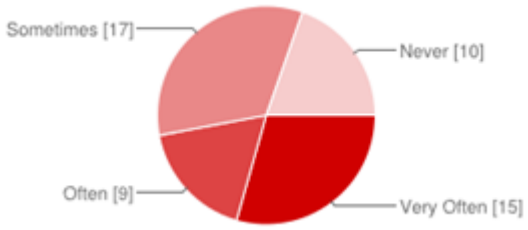
The results of the study as seen in Figure 10(a) show that pirated versions were popular amongst students. However they were unpopular with 22% of the students.



Very Popular	15	29%
Fairly Popular	14	27%
Somewhat Popular	11	22%
Not Popular	11	22%

Figure 10(a)-Popularity of pirated versions

Figure 10(b), shows that 29% of student population used pirated versions very often, 9% often, 33% sometimes and 20 % never used them. Studies report that males use pirated software more frequently than females and older students more than younger ones, based on self-reporting [6]. A similar trend was seen even in this study.

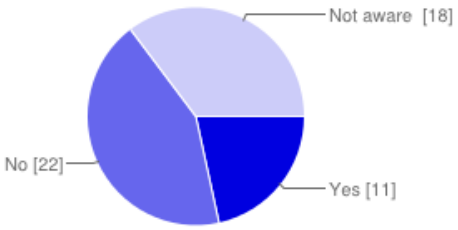


Very Often	15	29%
Often	9	18%
Sometimes	17	33%
Never	10	20%

Figure 10(b)-Use of pirated software copies by students

K. Seminars/workshops held in college on software usage

Figure 11 shows that regular seminars/workshops on software were held in the college though only 22% students acknowledged it. The contradictory responses indicated that maybe either not all students took them seriously or there wasn't enough publicity given to these programmes being held in college.



Yes	11	22%
No	22	43%
Not aware	18	35%

Figure 11-Seminars, workshops held in college on software usage

IV. PROBLEMS AND RECOMMENDATIONS FOR HELPING THE STUDENTS FOR EFFECTIVE USAGE OF SOFTWARE IN ARCHITECTURE

Some of the problems reported by students and recommendations to overcome have been made below:

1. Lack of orientation, seminars and workshops related to the knowledge and application of software in architecture makes it difficult for students to know and apply the software in architecture. Imparting the knowledge and application of the software can help the students to be abreast with the necessary skills and competencies of the technological requirement of the modern construction industry.

2. Indifferent and sometimes discouraging attitude of teaching faculty in usage of software in architecture discourages and frustrates the students. Therefore updating the skills and knowledge even of the teaching faculty is important. Professional development of teachers should ensure proficiency in technology usage specific to curriculum transaction and guidance of students. Several online professional learning networks can also help to support teachers with technology integration.

3. Lack of co-ordination and integration of various software in teaching, learning process, planning and presentation of assignments & projects, leads to improper documentation, record keeping and linkages required. So use of software in documentation and maintaining records of students' submissions, projects and evaluations would help both students and staff for ready references whenever required.

4. Poor internet connectivity leading to ineffective use of the CCAD lab. So despite having high end hardware and latest software, poor internet speeds makes its use restricted and frustrates the students while completing their work. Many give up halfway. Thus upgrading the speed and connectivity is need of the hour.

5. Little weightage is given in examinations to use and apply software. Thus it leads to lack of motivation on the part of the students to either learn or apply software knowledge in their various projects, designs or submissions. Encouragement and weightage in marks to software application would generate the interest of the students to learn more about the various software related to architecture and get them lucrative placements after graduation.

6. University should sponsor programs, seminars and workshops to motivate students and teachers to learn the skills in software application free of cost so that they can develop the necessary skills.

7. Accomplished architects must be invited to the institution to acquaint the staff and students with desirable soft skills expected of the passouts of the college so that an effort in that direction can be made by the staff and students.

CONCLUSION

One of the major objectives of all professional colleges is to equip their students with the skills required to function in the industry after their graduation. The findings of the present study reiterate the fact that Students must be introduced to and made competent in all kinds of software applications, which adds to their educational achievement and professional competency. They must be made familiar with the relevant Computer software, so that their performance does not lag behind their counterparts in other parts of the world.

APPENDIX I

1. Year of Study *
   - First Year
   - Second Year
   - Third Year
   - Fourth Year
   - Final Year
   - Pass outs
2. GENDER *
   - Female
   - Male
3. How often are software integrated in your Architectural Workflows*
   - Very Often
   - Often
   - Sometimes
   - Never

4. For which of the following do you commonly use Softwares? *
   - Sketching/Conceptualization
   - Photography
   - Rendering
   - Modeling
   - Presentation
   - Customized Printing/ 3D/Laser Printing
   - Plans and Sections
   - Designing

5. From where have you gained most of your knowledge and skills related to Architectural/BIM Softwares?
   - Experts
   - Teaching Faculty
   - Seniors
   - Self-Learning
   - Training Semester (4th Year or other)

6. Do you rather feel the need to be given orientation related to usage of Architectural Software by: *
   - College Faculty
   - Senior Students

7. Please name the Software you use most proficiently:*
8. How often do you use pirated versions? *
   - Very Often
   - Often
   - Sometimes
   - Never

9. Please name as many Architectural/BIM Softwares you are aware of? *
10. Which Architectural Software according to you is the most popular in your college? *
11. Which Architectural Software would you most want to learn?*
12. Do you feel that usage of Architectural Software be allowed in examinations, presentation and submissions?*
   - Yes
   - No

13. To what extent does the faculty encourage the usage of Architectural Software? *
   - Very Encouraging
   - Encouraging
   - Indifferent
   - Discouraging

14. Do you feel a course on awareness and application of Architectural Software be a part of the curriculum? *
   - Yes
   - No

15. What are your personal suggestions for helping students make more effective use of Software in Architecture?

V. ACKNOWLEDGMENT

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