Preparing Architecture Students for the Workforce: A Review of Essential Skills

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Abstract - The employability of students is a matter of serious concern in the global economy. All job seekers in architecture must have the necessary skills to keep up with the pace of innovative construction techniques and technological advancement. To ensure that graduates understand and meet the demands of the job market, it makes sense to implement soft skills according to the discipline of study. Changes in architecture education need to be made in response to the soft skills emphasis to increase students' employability. This paper examines various theoretical employability concepts and models, concentrating on different skill sets to reduce the skill gap between students and the industry. The objective is to suggest a model with a set of non-technical (soft) skills that will improve the employability of assistant architects from polytechnics. The results of this study's implications will be beneficial to architecture students who concentrate on developing their soft skills as well as to institutions in their efforts to redesign their curricula to meet industry needs.

Keywords: Employability, Employability skills, Soft-Skill set, Competencies, Architecture Education

I. Introduction

Unemployment and underemployment are a matter of great concern in today's competitive and fast-growing economies. Employability has become a universal issue for all countries as it has emerged as a critical factor in determining the socio-economic strength of the nation [1]. As per a recent survey, it has been found that the talent shortage is 16 years high. The global average talent shortage is 75 percent, whereas in India, it is 83 percent [2]. The employment rate of Indian youth went dangerously down as half estimated by the World Bank estimates of 23.2 percent in the year 2020-21 [3]. This manuscript takes into account the state of polytechnic-trained professionals in the architecture trade only. The employability of technically trained talent was 32 percent in the year 2020 and dropped down 5 percent in the following years continuously [4].

1.1 Skills and Competencies Required for Architects

It is of great concern in, industries like production and services, the work can be done offshore but the architecture industry is the only one, where the people need to work on the site to complete the projects at hand. The buildings, roads, and other civil facilities play a very important role in strengthening the economy of a country for other industries and services. The skill shortage in this field is neither good for society nor for the employers involved in this sector. The employers have been complaining about not getting the desired skills in youth, thus pass-outs from technical institutions are not absorbed, and thus shortage thereof. This manuscript is focused on finding out the strengths and weaknesses of technical professionals from polytechnics of architecture trade, that hinder their placement.

According to research, it has been found that the broader academic and higher education profile is not sufficient for becoming placement-ready successful professionals but, other skills are too necessary [5]. The other factors have been Critical thinking, Communication, Collaboration, and Creativity, the 4Cs [6]. The mismatch of professional skills with 4C factors creates a gap in the Demand and Supply of technical professionals from the trade in concern. Various research studies have elaborated that the development of employability skills has not been on the priority list during training periods while armouring trainees with theoretical knowledge [7-10]. The demand of the profession needs aptitude and expertise that trainees lack in the eyes of Employers despite three years of specialized courses. During the survey, it was found that 80 percent of the employers and skilled professionals agreed about this fact [11]. In modern times, employers place more emphasis on professionals' high competencies and capacity to adapt to the industry's rapidly changing non-technical skill needs [12-14]. The candidates needed to be equipped with employability skills that are a combination of technical and non-technical skills. The people with non-technical skills, add value to the assets of the employer.

1.2 Rationale of the Study

Considerable work has been done all over the world, on the subject cited in this manuscript. The literature shows that the researchers focus on finding the reasons for the skill gap between the availability of skills in fresh graduates and the employers' demands. The dynamic work environment urges work in the field to bridge the gap. The main objective of the manuscript is to review the literature and try to find out the parameters of skills needed to bridge the gap between the demand and supply of manpower for employment in the architecture trade as desired by this specific industry.

Review Of Literature

2.1 Employability

Employability means necessary fulfilling pre-requisites for employment. Employability is the attribute, skills, and knowledge that all participants of the labour market should possess to ensure that they have the capacity to be effective at the workplace for the benefit of themselves, industry, the country's economy, and the world as a whole [15].

Employability refers to a person's capability of gaining initial employment, maintaining, employment, and obtaining new employment, if needed [16]. It is a new form of psychological contract between the employer and the employees [17]. Employability relates to the property of students to obtain a job [18]. It is about how individuals emerge with opportunities and reflect and articulate their skills and competencies [19]. The capacity and the willingness to be and to remain attractive in the labor market, by anticipating changes in tasks and work environment and reacting to these changes in a proactive way [20]. It is a form of work-specific active adaptability that enables workers to identify and realize job opportunities [21]. It is the perceived ability to get employment relevant to an individual's qualification level [22]. From the available literature it has been found that there are three components to developing employability:

1. Possessing employability traits,

2. Enhancing one's ability to market oneself and manage one's career and

3 Being open to learning and reflecting on what one has learned [23].

2.2 Employability Skills

It has been seen while going through the published research papers that there has been no consensus on a single definition of employment skills. This term indicates the abilities needed to gain and maintain a job. The scholarly articles for employment skills reviewed and are listed herein.

These are the basic skills necessary for getting, keeping, and doing well on a job [25]. The skills are required not only to gain employment but also to progress within an enterprise so as to achieve one's potential and contribute successfully to the enterprise's strategic directions [26]. These soft skills are a new way to describe a set of abilities or talents that an individual can bring to the workplace [27]. The personal qualities, attributes, or the level of commitment of a person that set him or her apart from other individuals who have similar skills and experience [28]. It is a set of achievements, understandings, and personal attributes that makes individuals more likely to gain employment and to be successful in their chosen occupations [29]. The employability skills are generally skills that cut horizontally across all industries and vertically across all jobs from entry-level to the chief executive officer [30]. This is a set of skills required to acquire, maintain, and progress in a job [31]. General and non-technical competencies are required for performing all types of jobs [32]. The employability skills focus on graduates' abilities to adapt and use their personal and academic skills to create more employability with employment [33]. These skills are required not only to gain employment but also to progress within an enterprise so as to achieve one's [potential and contribute successfully to the enterprise's strategic directions [34]. It is the ability to perform engineering-related skills, knowledge, and personal attributes to gain employment, maintain employment, and succeed in the engineering field [35].

The other types of skills for term employability skills as expressed in various research articles are transferable skills, generic skills, necessary skills, core skills, and key competencies [36-41]. It has also been mentioned that a person needs a combination of transferable skills, technical skills, and subjective knowledge [42]. The employment skills are transferable across all industries and all job levels from entry-level to high-level profiles. It is a blend of technical and job-specific skills namely hard skills and non-technical and generic skills namely soft skills. The employers emphasize soft skills and opine that the employer itself can groom its professionals for desired technical skills according to their needs.

2.2 Other Skills Discussed in Literature

Various articles and papers from 2010 onwards that focused on different skills for gaining employment are being quoted herein.

In the year 2010, the studies enlisted verbal reasoning, logical reasoning, and soft skills sets besides core employability skills, communication, and professional skills [43-44]. With the changes in the industry needs, in 2012-2014, the scholars noted that the number of various skills increased from three to sixteen namely skills with personal attributes as a new skill [45-48]. In the year 2014 onwards till 2022 with the introduction of Information Technology tools the skills variety increased further to 45 skill constructs [49-67]. These construct skill sets besides others have been high-order thinking skills, people/social skills, self-perceived skills, affective skills, transferable skills, subject knowledge, digital generic skills, personal attributes, modern employability skills, career-related and teamwork skills, critical thinking skills, and communication skills.

2.3 International Conceptual Framework on Employability

The researchers, at the international level, have developed a conceptual framework of employability skills and have been used as a reference here in this manuscript [68].

Since 1990, in the United States of America, the Secretary's Commission on Achieving Necessary Skills (SCANS) and the American Society for Training and Development (ASTD) suggested models with sixteen employability skill groups across all job families The U.S. Department of Labour identified five competencies using resources, interpersonal skills, information, systems, and technology as essential employability skills.

The employability skill framework was developed by the Conference Board of Canada (CBC) in 1996. According to this employability skills are vital abilities that are required in the workplace and can be used outside of it in daily and private activities [70]. This framework consists of three skill groups; fundamental skills (communication skills using numbers, thinking and solving problems, managing information), personal management skills (demonstrating a positive attitude and behavior, being responsible, being adaptable, learning continuously, working safely), and teamwork skills (work with others, participate in projects and tasks). Table 1 represents the skills discussed in the scholarly articles on the international framework.

Table 1: Employability Skills as Discussed in International Frameworks

Country	Reference	Skills	SKILLS DISCUSSED
USA	(Overtoom, 2000) [69]	42 skills	Applied Knowledge, Effective Relationships, Workplace Skills, Resource Management, Information Use, Communication Skills, Systems Thinking, Technology Use
Canada	(CBC,2000) [70]	11skills	Fundamental Skills, Personal Management Skills, Teamwork Skills
Australia	(CCI,2002) [71]	8 skills	Communication skills, Teamwork skills, Problem-solving skills, Initiative and enterprise skills, Planning and organizing skills, Self-management skills, Learning skills, and Technology skills.
Malaysia	(Abdullah, Anuar, & Ismail, 2019) [72]	8 skills	Communication skills, Critical thinking, Problem-solving, Teamwork, Leadership skills, Lifelong learning, Entrepreneurship skills, Moral and professional ethics
UK	(Kent, 2011,Retrieved 2016) [73]	9 skills	Numeracy, IT skills, Communication skills, Teamwork, Research, Critical thinking, Creativity, Problem-solving, Organizational skills, Commercial awareness
China	(Xiaobing & Xin, 2013)[74]	9 skills	Personal qualities, Basic knowledge, Skills, and Abilities, Honesty, Independence, Self-confidence, Adaptability, Enthusiasm Interpersonal relationships, Teamwork, Strain capacity, Problem-handling capacity, Leadership
Japan	(Ito, Challenges towards Employability: Higher Education's Engagement to Industrial Needs in Japan, 2014) [75]	9 skills	Critical thinking, Problem-solving, Collaboration across networks and learning by influence, Agility and adaptability, Initiative and entrepreneurialism, Effective oral and written communication, Accessing, and Analyzing Information, Curiosity, and Imagination.

As per the National Centre for Vocational Education Research, the Mayer Committee report on generic skills was published by the Australian Education Council and the Mayer Committee in 1992. Another thorough investigation into the abilities needed by both new and experienced employees to function successfully in organizations was conducted in 2002 by the Australian Chamber of Commerce and Industry (ACCI) and the Business Council of Australia (BCI). This report derived a list of eight essential skill groups known as employability skills, which include communication skills, teamwork skills, learning skills, problem-solving skills, planning and organizing skills, self-management skills, initiative and enterprise skills, and technology skills [71].

An initiative was taken by the Ministry of Higher Education, Malaysia, and the University of Utara, Malaysia to develop and improve the employability skills of Malaysian students. According to this document, the essential soft skills include communication skills, critical thinking, leadership skills, problem-solving, entrepreneurship skills, teamwork, lifelong learning, and moral and professional ethics [72].

The University of Kent [73] provides careers and employability services to students. The studies revealed that employers look for graduates who have vast experience and the ability to demonstrate various skills that have been achieved during studies and work experience. The main employability skills include Numeracy, IT skills, creativity, communication skills, teamwork, research/critical thinking, problem-solving, organizational skills, and commercial awareness.

Employers in China place a high value on students' employability and employability skills as the most important qualification. These employability skills include basic knowledge, personal qualities, self-confidence, honesty, independence, teamwork, adaptability, enthusiasm, Interpersonal relationships, leadership, strain capacity, problem-handling capacity, information technology software applications, and presentation skills [76].

The methods used by 23 Japanese universities attempting to raise employability standards were selected for the national project "Improving Higher Education for Meeting Industrial Needs." The necessary skills and qualities were developed in consultation with 530 Japanese companies which include critical thinking and problem solving, collaboration across networks and learning by influence, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analyzing information, and curiosity and imagination [77].

III. Cotton Employability Model of Non-technical Skills

After going through the above-mentioned research papers and frameworks adopted by various countries mentioning different models/frameworks; the best-suited and self-explanatory model for soft skills is the Cotton (2000) model of employability skills (non-technical skills) [78].

Table 2: Employability model proposed by Cotton's (2000)

BASIC SKILLS	HIGHER-ORDER THINKING SKILLS	AFFECTIVE SKILLS and TRAITS
*Oral communications (Speaking, listening) *Reading, especially understanding and following instructions *Basic arithmetic *Writing	*Problem-solving *Learning skills, strategies *Creative innovative thinking *Decision making" (Cotton, 2000)	*Dependability/Responsibility *Positive attitude toward work *Conscientiousness, punctuality, efficiency *Interpersonal skills, cooperation, working as a team member *Self-confidence, positive self-image *Adaptability, flexibility *Enthusiasm, motivation *Self-discipline, self-management *Appropriate dress, grooming *Honesty, integrity *Ability to work without supervision

Table 2 represents Cottons' model which indicates the employability skills in three major subheads such as basic skills, higher-order thinking skills, and affective (personal skills).

This model is condensed from 63 documents related to employability skills and is organized into three heads namely basic skills, higher-order thinking skills, and affective skills. These categories are framed following the expectations of employers in general without any regard to a particular industry.

3.1 Employability Skills (Non-Technical) For Architecture Students from Different Polytechnics

The non-technical skills (soft skills) presumed of architecture students are aligned towards the technical, practical, and introductory nature of the field. With the Cotton model as a reference and considering other frameworks, the employability skills suitable for Architecture students are consolidated below:

3.1.1. Basic Skills

Basic skills include oral communication (speaking, listening), Basic arithmetic/numeracy, writing, and reading especially understanding and following instructions. Communication skills allow you to understand and be understood by others. It includes listening, speaking, writing, reading, and numeracy. Apart from these, Presentation skills are also considered very important for architecture students as mentioned in the research.

Table 3: Checklist of Basic Skills

Cotton's Model of Basic Skills	Skills Mentioned in		Total no. of papers in which mentioned
	Various research works from the reviewed literature	International Framework	
Oral communications (Speaking and listening)	[43-57], [59-67]	[69-73], [75]	30
Reading, understanding, and following instructions	[43], [51], [53], [56], [60-62], [65]	--------	8
Basic arithmetic/Numeracy skills	[51], [53], [54], [56], [57], [60], [62-65]	[69-70], [73]	13
Writing	[48], [51], [53-56], [58], [60-65], [67]	[69-73], [75]	20
Basic skills from existing research			
Presentation Skill	[46], [55], [60], [64], [66]	-------	5

Table 3 depicts a checklist of five basic skills that are based on Cotton's model (2000) and models that are commonly accepted in various research.
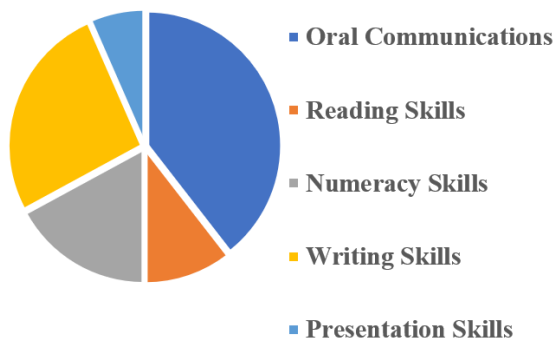

Figure1. Basic Skills

Figure 1 represents the frequency of papers in which basic skills mentioned as per Table 3 are represented. Oral communication is highly mentioned in research papers followed by writing skills and then basic arithmetic/ numeracy. Presentation skills being important for architecture students is mentioned in five research papers.

3.1.2. Higher-Order Thinking Skills

These include Problem-solving, Learning Skills, Creative thinking/Innovative thinking, and decision-making skills. Critical /Analytical thinking skill is also considered one of the important skills for architecture students.

Figure 2. Higher-Order Thinking Skills

Table 4: Checklist of Higher-Order Thinking Skills

Cotton's Model of Higher-Order Thinking Skills	Skills Mentioned in		Total no. of papers in which mentioned
	Various research works from the reviewed literature	International Framework	
Problem-solving	[44]-[46], [48]-[49], [51], [54], [56-60], [62-63], [65], [67]	[69-72], [74-75]	22
Learning skills, strategies	[45], [52], [56], [57], [60], [63]	--------	6
Creative, innovative thinking	[44-48], [51-57], [60], [63-66]	[69], [74]	18
Decision making	[43], [48-49], [53-54], [56], [60], [65-67]	[69]	11
Higher-Order Thinking Skills from existing research			
Critical /Analytical thinking	[51-55], [59-62], [64-65], [67]	[69-70], [72], [73], [75]	17

Table 4 shows a checklist for five higher-order thinking skills based on Cotton's (2000) model and models commonly accepted in various research.

Figure 2 represents the frequency of papers in which higher-order thinking skills are being mentioned as per Table 4. Problem-solving is a highly mentioned skill in research papers followed by Creative, innovative thinking, and then Critical /Analytical thinking. Decision-making and learning skills are other important skills.

3.1.3. Affective Skills

Affective skills are defined as individual interests, behaviors, attitudes, and values. These are the personal skills of the individual. Figure 3 represents the frequency of papers in which affective (personal) skills are being mentioned as per Table 5.
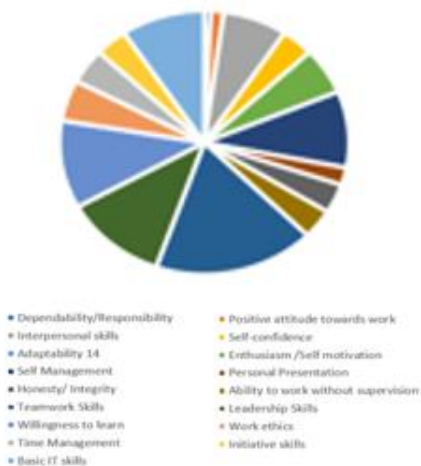
Figure 3. Affective Skills

Table 5: Checklist of Affective Skills

Cotton's Model of Affective Skills	Skills Mentioned in		Number of papers
	Various research works	International Framework	
Dependability/Responsibility	67	-----	1
Positive attitude toward work	47	70	2
Conscientiousness, punctuality, efficiency	____		
Interpersonal skills, cooperation, working as a team member	47,52, 53, 56, 58, 62, 65, 66	69, 73	10
Self-confidence, positive self-image	56,58,63, 67	74	5
Adaptability, flexibility	44, 47, 49, 52, 53, 55, 56, 58, 61, 63	69, 70, 74, 75	14
Enthusiasm, Self-motivation	43, 44, 47, 48, 54, 60, 64	74	8
Self-discipline, self-management	43, 44, 45, 49, 51, 54, 57, 60, 63, 64, 65	69,71	13

Appropriate dress, grooming	48, 54, 63	----	3
Honesty, Integrity	44, 56, 63	69, 74	5
Ability to work without supervision	52, 56, 63	69, 74	5
Affective Skills from existing research			
Teamwork skills	43, 44, 46, 47, 48,49, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 64, 65, 66, 67	69, 70, 71, 72,73, 74	26
Leadership skills	43, 47, 48, 49, 53, 54, 56], 57,58, 60, 62, 66, 67	69, 72, 74	16
Willingness to learn	44, 47, 58, 64, 61	69	6
Basic IT skills	44, 46, 48, 49, 50, 53, 54, 55, 56, 57, 58, 59, 61, 62, 65,66, 67	69, 71, 73	20
Work ethics	47, 49, 53, 55, 56, 57, 63	69, 72	9
Time Management skills	47, 48, 57	69	4
Initiative skills	49, 62	69, 70, 71	5
Entrepreneurship skill	44, 45, 54, 55	71, 72, 75	7

Table 5 represents a consolidated list of skills from Cotton's (2000) model and existing research. Teamwork skill is a highly mentioned skill, followed by basic IT skills and then leadership skills, adaptability, flexibility, and self-discipline /self-management.

IV. Consolidated List of Employability Skills For Architecture Students From Polytechnics

A student of architecture must acquire. Oral communication which comes under basic skills is the most important skill competency, followed by teamwork from affective skills, and then comes problem-solving skills from higher-order thinking skills. Writing skills and basic information technology skills have an equal impact on employability followed by creativity and critical/analytical skills that come under higher-order thinking skills. Leadership and adaptability from affective skills are must to be employable. Numeracy and self-management skills are equally important. Apart from the above-mentioned skills decision-making, interpersonal skills, work ethics, reading skills, enthusiasm, and entrepreneurship skills are also important. Honesty, ability to work independently, initiative-taking skills, time management skills, and personal presentation are the skills that an employer expects from employees.

Table 6: Consolidated List of Employability Skills

Non-Technical Skills (Soft Skills)	
Basic Skills	Oral Communication (Listening and speaking), Reading, and comprehending skills, Numeracy skills, Writing skills, and Presentation skills.
Higher-order Thinking skills	Problem-solving, Learning Skills, Creative /Innovative thinking, Decision-making, and Critical thinking /Analytical skills
Affective Skills	Teamwork skills, Leadership skills, Willingness to learn, Adaptability, Basic IT skills, Self-management, Interpersonal skills, Work ethics, Enthusiasm and self-motivation, Entrepreneurship skills, Time Management skills, Personal Presentation skills, Honesty and Integrity, Ability to work without supervision, Initiative skills.

Table 6 revealed the set of non-technical (soft skills) from the literature study that a student of architecture from a polytechnic must acquire in order to enhance employability.

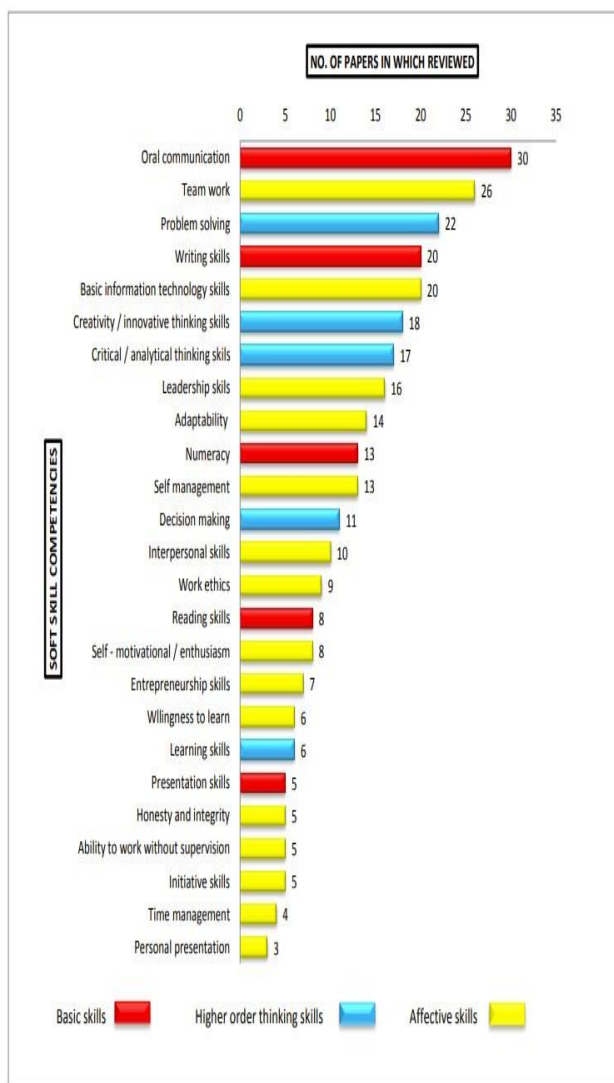Skills mentioned in table 6 can be condensed and represented in Figure 4.

Figure 4: Top 25 Non-Technical/Soft Skill Competencies

Figure 4 represents the list of the top 25 non-technical (soft skill) competencies from a consolidated list of employability skills as mentioned in Table 6.

To find authentic information about the subject, concerned literature from various sources was analyzed. Some of the shortlisted research papers are from the last twenty years that conducted empirical studies, involving the assessment of skills in diploma holders and expectations of employers and academia, and curriculum, training, and teaching-learning process that enhance employability. Most of this work suggested applying models to enhance employability skills amongst employable diploma holders. To assess the present situation of employability, it is the need of the hour to investigate the problem in depth and find factors responsible for the low employability of architecture diploma holders. A pilot study was conducted to find out the facts from the diploma holders from Punjab state. Forty-six subjects were given a questionnaire based on above mentioned skills to gather information from the students about their knowledge and various skills.

The questionnaire was designed as suggested by Cotton's Model for the assessment of skills of the diploma holders concerned from one polytechnic from Punjab state of India with students from the previous four years to test the reliability and validity of constructs used in questionnaires. The results of Cronbach's alpha justify that the factors have good reliability (from High to Excellent). The second phase of the investigation (empirical data) from more than 500 subjects and a few dozen employers is in the process and the results will be made public as per availability in the times ahead.

V. Conclusions

The literature review has helped in the preparation of a consolidated checklist of necessary non-technical/soft skills for architecture students from polytechnics. It will be used in the development of a final comprehensive skill set for research after verification from employers and academia. The skillset list will be helpful to the architecture students focusing on career progression. The implications of this study will prove to be a reality check for those institutions following an old curriculum and of great help to institutions in the process of improving the curriculum as per current scenarios and industrial needs.

As per the current status of employability skills in India, students who are about to enter the workforce; only be successful in fulfilling the criteria set by employers as graduates emphasize technical skills. Also, Academia from educational institutes gives more importance to technical skills rather than non-technical/ soft/generic skills. However, Employers assess prospective employees on both their technical and non-technical skills. Thus, in addition to technical knowledge and skills, it is imperative to develop soft skills. Finally, we think it's critical for architecture programs to include these soft skills in their curriculum and for students to actively work on honing them in order to improve their chances of success in the workforce.

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