Project Completion Report

Assessing the Factors Responsible for Mismatch between Demand and Supply of Requisite Skills in Engineering Aspirants with Special reference to Madhya Pradesh

Implemented by

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Every care has been taken to provide the authenticated information. However, the onus of authenticity of data rests with the PI of the project.

PREFACE

The report examined the factors responsible for mismatch between demand and supply of requisite skills among engineering aspirants with special reference to Madhya Pradesh. Especially it analyzed requisite skills demanded by industry, availability of skills, factors responsible for mismatch and effectiveness of training imparted to engineering students.

The study employed primary and secondary data on 275 Academicians, 100 Industrialists (HR professionals) and 300 Engineering Students for the period of 2019-2022. The data were sourced using self-administered questionnaire approach. The study used descriptive approach. In analyzing data various statistical tools of analysis like Factor analysis, correlation and regression analysis and frequency analysis were applied.

Descriptive statistics revealed that requisite skill demanded by industry is having positive and significant impact on employability among engineering aspirants. Industries gave first importance to technical skills in students, second importance to next generation skills, third importance to management & entrepreneurial skills, fourth to communication skills and fifth to personal attributes skills. As far as availability of requisite skills among engineering students are concerned the highly available employability skill is personal attributes, second available skill is communication skills, third available skill is technical skills, fourth available skill is management & entrepreneurial skills and fifth available skill is next generation skill which have positive and significant impact on employment. Furthermore, respondents revealed that inappropriate training program, lack of collaboration for skill enhancement, lack of innovation and creativity among students, lack of financial

support from government, recruitment and retention of qualified teachers, economic and global factors and inappropriate teaching pedagogy methods are the main factors responsible for the mismatch. Due to these factors, large amount of consequences faced by many stakeholders. From academicians point of view lack of investment in education sector, lack of innovation and creativity, increase in recruitment of substandard workforce are top three consequences and from industrialists point of view number of enrolments and closure of engineering institutes, deviation of students to other graduate programs and certification courses and increase the recruitment of substandard workforce are the top three consequences of mismatch. Moreover, to evaluate the effectiveness of existing training programme statistical data exposed that various training programs provided by the institutes and universities are helpful in getting good placement after completing the engineering course.

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Place:

Date: **Signature**

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Skills and knowledge are the driving forces of economic growth and social development for any country. Globalization, knowledge and competition have intensified the need for highly skilled workforce in both the developing and developed nations as it enables them to accelerate the growth rate of their economy towards higher trajectory. Today all economies need skilled workforce so as to meet global standards of quality, to increase their foreign trade, to bring advanced technologies to their domestic industries and to boost their industrial and economic development. Even, it has been observed that countries with highly skilled human capital tend to have higher GDP and per capita income levels and they adjust more effectively to the challenges and opportunities of the world of work. Furthermore, today, companies are also requiring their workforce to have higher levels of skills to enable them to engage in innovation, improve the quality of products/services, and increase efficiency in their production processes.

India is a fast developing country and moving progressively towards 'knowledge economy'. From primary sector of agriculture, India is stirring to secondary sector of manufacturing, construction and also territory sector of trade, transport and finance. Its workforce is second largest in the world after China. Over 65% of India's large population is below 35 years of age and working age group of 15-59 years is increasing steadily. India has the advantage of productive workforce over the world as 12.8 million young people newly entering the labour market every year (GOI 2011a) but the government recognizes that the country faces a serious skills shortage, as the majority of these new labour market entrants are likely to remain unskilled. So, it becomes increasingly important that the country should focus on advancement of

skills as it is a viable strategy for bringing advanced technologies to their domestic industries, expanding their foreign trade, and thereby boosting industrial and economic development. Moreover, the availability of skilled workforce in a country is a key determinant for MNCs for investments as they increase the efficiency and flexibility of the labour market as well as help to remain competitive and achieve sustainable growth.

As far as engineering discipline concern, it is a profession that is in a constant state of flux as it responds the constantly changing and evolving demands of the society in which it functions and in order to cope up with these demands it is very important that engineering students must have some basic core competency to learn new skills. But many incoming students do not have the background and skills required to succeed in the design of solutions to engineering problems. This resulted in deterioration in the demand of engineering candidates at national and international platform by industries and organization as they are not getting ready made skilled manpower that could be fruitful to their system. These situations somewhere misbalance the demand and supply of engineering aspirants in labour market. Hence it is very essential to identify and better understand the basic set of core competencies that, if possessed by the student, would assure their success in the engineering education environment as well as in industry upon graduation. Therefore, through this project, researcher has focused toward accomplishment of the following objectives:

1. To estimate the number of engineers and requisite skills demanded by industry among aspirants against supply
2. To identify the available employability skills in engineering aspirants.

3. To study the various factors responsible for mismatch between demand and supply of requisite skills.
4. To study the consequences of mismatch between demand and supply of requisite skills.
5. To study the employability of engineering campuses in Madhya Pradesh.
6. Assessing the effectiveness and appropriateness of training imparted to Engineering Aspirants.

In order to achieve the objectives, researcher has targeted three populations: Engineering Students, Engineering Academicians and Industrialists (HR professionals) from IT, Automobile and Pharmacy industry. Through cluster sampling and simple random sampling methods sample of 300 engineering students, 300 engineering academicians and Industrialists (HR professionals) were drawn from total population. Furthermore, for the purpose of data collection, Primary data was collected through questionnaire method and secondary data was collected through Internet, journal, magazines, government websites etc. Before the major data collection, validity and reliability of questionnaire were checked through pilot survey and Cronbach's alpha test. After data were collected, proper tools and techniques like basic statistical methods (Mean, Mode Medium, percentage), factor analysis, correlation and regression analysis, frequency analysis was applied for classification and analysis of data.

The detailed analysis revealed the results that inappropriate training program, lack of collaboration for skill enhancement, lack of innovation and creativity among students, lack of financial support from government, recruitment and retention of qualified teachers, economic and global factors and inappropriate teaching pedagogy methods

are the main factors responsible for the mismatch. Furthermore data also defined that Requisite skill demanded by industry is having positive and significant impact on employability among engineering aspirants. Moreover The results also shown that the most important and first available employability skill at fairly high level is Personal attributes skills in students; Second important skill available in students is Communication skills; Third important skill available in students is Technical skills; Fourth important skill available in students is Management & Entrepreneurial skills and Fifth important skill available in students is Next generation skills. As far as data regarding consequences are concerned, the major consequences due to the mismatch are According to academicians, lack of investment in education sector, lack of innovation and creativity, increase in recruitment of substandard workforce are top three consequences and from industrialists point of view number of enrolments and closure of engineering institutes, deviation of students to other graduate programs and certification courses and increase the recruitment of substandard workforce are the top three consequences of mismatch. In last, analysis on training effectiveness and appropriateness also revealed that Various Training Programs provided by the institutes and universities are helpful in getting good placement after completing the engineering course.

As a solution and recommendations to overcome the problems it is essentially require focusing on school education system. The fundamental knowledge needs to be strong and able to build a personality ready to choose the career of his/her choice. Indian education system should analyze education system of some developing countries like Germany, Singapore, and Finland where education system is being built as a backbone of the country & more than 20 per cent of the GDP is being utilized for education sector. Furthermore, the institutes running in south India are helping the

students who want to start their own business as an option after graduation. The students will get the help of finance and space for start-ups sponsored by the institutions for the innovative ideas. Even it is also require to evaluate our education policy and updating according to famous European policies like bologna, bloom taxonomy, PLO (Programme learning outcome), SLO (Subject learning outcome),CLO(Course learning outcome) etc. Moreover, Institute/University should design their curriculum, which is strongly oriented towards solving industry issues as well technological challenges of the industries. Institute need to think globalized and prepares their students for global challenges and opportunities. There is also need for improvement among faculty members. They should be encouraged to get engaged in suitable outside relationships with the industry. Academicians need to improve training program imparted to students like there must be Increase interaction between educational institutes and industries. Institute should provide interdisciplinary training in order to improve requisite skills in engineering aspirants. Institute must develop feedback mechanism to review effectiveness of training program. Creation of Industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects and creation of incubation centers keeping in view local industry ecosystem requirements will reduce the skill gap. The main conclusion of the study comes out with the fact that there is a mismatch between demand and supply of requisite skills in engineering aspirants in Madhya Pradesh. Training and skill enhancement is having positive and significant impact on not only improving the employability of students but also improves the scientific and research productivity of students in India & Madhya Pradesh. Hence this research is very helpful for industry, academicians & government to design strategies for the development of economic status of India.

CHAPTER 1
INTRODUCTION

CHAPTER -1

INTRODUCTION

1.1 INTERNATIONAL ENGINEERING STATUS

Companies are going global today with a vast majority of its products and service catering to the world. Companies are not just facing competition from within its domestic boundaries but also from its global peers. The competitiveness of an organization often defines the quality of its workforce and the skills that would be possessed by the workforce. The talent available in emerging markets such as India, China is increasingly being hired by the employers in mature markets such as America and Europe creating a global workforce. The expansive pool of millennial professionals in India is set to become one of the largest labour forces in the world by 2027. Hence, India's potential to explore the global job market with its skilled personnel is beyond question (India skills report 2018).With the Indian talent competing against the best of the best in a globalized economic environment; it's highly relevant to know, what are the skills that are considered to be highly important among employers across the globe. Overall, across the globe, problem solving, the ability to work in a team, and communication, are the most important skills (QS Global Skills Gap in 21st Century). Dealing with conflict or conflict resolution is also another highly sought after skill considered by the employers while considering the pallet of talent across the globe. Now days, this particular skill deserves more attention. Even, it is also defined by the American Psychological Association (APA) as "the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress - such as family and relationship problems, serious health problems or workplace and financial stress. It means 'bouncing back' from difficult

experiences". Thus, unavailability of such an important skill will necessarily mean absence of ability to handle stress or conflict which the graduate is going to encounter while experiencing a new role. Hence it is essential to inculcate these skills in graduates.

With the ever-changing global landscape there is an effluent need for certain skills that are the future of engineering. These skills represent the dawn of a new age where the redundancy and animosity posed by human errors would become completely irrelevant. Thus, it is not just essential but the natural process of evolution for the students to be well versed in the skills that might hold the key to future. The knowledge of Artificial Intelligence, Data Sciences, Data Engineering, Machine Learning are quite often referred to the new age skills or the next generation skills. As a matter of fact many of these skills are subsequently an extension of programming skills, in other words at the heart of the matter is the sound knowledge of basic programming skills in order to master these next generation skills. Programming is a perquisite skill demanded by employers but now a day's employers are searching for graduates that possess expertise in one or more areas. Automation and A.I are changing the face of both industry and economy and its impact on business and society is unparalleled. Some skill categories will be less in demand. Basic cognitive skills such as Data input and processing have gone down and will continue to decline. Companies will need to make significant organizational changes at the same time as addressing these skill shifts to stay competitive.

Over the next 10 to 15 years, the adoption of automation and artificial intelligence technologies will transform the workplace, as people increasingly interact with ever smarter machines. These technologies, and that human-machine interaction, will bring numerous benefits, in the form of higher economic growth, improved corporate

performance, and new prosperity. Companies in many countries complain that they have trouble finding the talent they need, and workers often complain about being under qualified or even overqualified for their jobs. Skill shortages and mismatches have negative implications for the economy and the labor market. They can result in increased labor costs, lost production slower adoption of new technologies, and the implicit and explicit costs of higher unemployment rates due to unfilled vacancies. Furthermore, A still-unanswered question about AI and the latest automation technologies is whether they will continue to favor high-skill workers over low-skill ones-or perhaps affect workers at all skill levels. One risk is that the recent decline of middle-income jobs and growing inequality could intensify as companies compete for talent to overcome both an excess supply of some skills and an excess demand for others. The impact on wages for different job profiles could be a greater polarization even than today, with people who carry out non repetitive, digital work seeing above average wages, while pay for repetitive, non digital jobs might be below average. Today, we have the advantage of foreseeing the skill shifts to come, which gives us some time to anticipate and adjust for these and other social changes that may accompany automation and AI adoption. The development of automation enabled by technologies including robotics and artificial intelligence brings the promise of higher productivity, increased efficiencies, safety, and convenience, but these technologies also raise difficult questions about the broader impact of automation on jobs, skills, wages, and the nature of work itself. Many activities that workers carry out today have the potential to be automated. Job matching sites such as LinkedIn and Monster are changing and expanding the way individuals look for work and companies identify and recruit talent. Independent workers are increasingly choosing to offer

their services on digital platforms including Upwork, Uber, and OLA and, in the process, challenging conventional ideas about how and where work is undertaken.

Hence it is evident that there is essential need to strengthen the infrastructure to pave way for smooth transition for these skills.

1.2 NATIONAL ENGINEERING STATUS

Economic growth is a reflection of jobs created and skills and knowledge are evident requirements for any job. Both developed and developing countries are focusing on skilling people and India is no different. Our aim is to become the future skill capital of the world and government is not leaving a single stone unturned. In India more than 62% of its population in working age group of 15-59 years, and more than 54% of its total population below 25 years of age, which is feasible. Recent skill programs such as National Skill Development Mission, digital India are examples of government's action to move towards reality. Today's job market and in-demand skills are entirely different from the ones of 10 or even 5 years ago and the pace of change is only set to accelerate. New jobs require new skills which either does not exist or the population is niche. Building a skilling system that responds well to business needs, while opening opportunities for all people is the need of the hour for the match new requirements, a system. It is also transforming the way employers invest in their workforce and use the skills of their employees can help meeting new skill requirements.

Furthermore, According to Robinson (2000), Employability skills are "those basic skills necessary for getting, keeping, and doing well on a job." These are the critical tools and traits required to perform tasks at workplace. These skills are much sought after these days by employers. The needs of employability skills differ from country

to country and from sector to sector and from time to time. However, certain qualities such as communication skills, interpersonal skills, integrity, right attitude, problem solving, decision making and team building skills can be taken as a few common skills of employability skills. In other words, Employability skills are the 'ready for work' skills vital to do the job. (Menon, 2014)

Moreover, recent years have seen policy-makers and social partners across the world become increasingly concerned with the match between their workforces' skills and their labor markets' needs. Skills mismatch, the gap between the skills required on the job and those possessed by individuals, raises the question of the ability of societies to capitalize on their workforces. Skills are also a critical asset for individual workers and firms in a rapidly changing and globalized world. When individuals have substantially more skills than required for their jobs, those individuals, as well as enterprises and economies, are prevented from reaping benefits of their skills investment such as higher wages, productivity growth and innovation. Labor markets are dynamic and characterized by information asymmetries. As a result, different types of skills mismatches coexist, including skill shortages, qualification mismatches and skill gaps.

As per the World Economic Forum the future of jobs report, cognitive ability such as creativity, logical reasoning and problem sensitivity, will be required in jobs in upcoming years. More than 50% of jobs which require this ability do not require it today or only to a smaller extent. In about 30% of jobs demand for these skills is already high and is likely to remain so till few more years. According to Khare,(2014) About 60 percent of the jobs have been forecasted for the service sector in India but there exists a wide gap in the employability skills required by the industry and those possessed by the graduating students in India. In this support Cumming (2010) stated

that in a competitive environment, economic graduates who have more employability skills will be more successful. So, students' employability skill must be continuously adapted to labor market needs. Some researches show that graduates do not have the skills needed for the modern workplace.

Thus, there is an essential need to identify the factors and reasons for this mismatch. It is also required to evaluate standard employability skills which should be possess in indian graduates for competing in global market.

1.3 MADHYA PRADESH AS A STATE

1.3.1 Industrial Profile

Madhya Pradesh known as the heart of incredible India is the sixth largest state in India by population and its unique geographical location makes it a central hub for transportation and various other industrial economic activities. Madhya Pradesh provides an excellent infrastructure to nurture robust industrial growth. The state has a robust rail network with 550 trains crossing daily, National Highway network of 5,000+ kms, 5 commercial airports operating 100+ flights and 6 inland container depots (ICDs). Madhya Pradesh has a strong base of mineral resources and accounts for 14% of India's total cement production. The state has an oil refinery at Bina with an annual capacity of 6 MMT. The installed power capacity of the state is over 23,400 MW; 35% of which is contributed by renewable energy sources. The state is a leading producer of a variety of horticulture crops and offers lucrative opportunities for food processing industries. The state also offers opportunities in textile manufacturing, automobiles, food processing, soya processing, engineering, and agriculture equipment manufacturing, among others.

Key Sectors driving growth

- **Agri Business and Food processing**- There are 2 mega food parks, 8 food parks, 5 Agricultural export zones and 45 industrial areas for the Agri business and food processing sector. These food parks have all the common facilities expected in an industrial park along with common facilities needed for Agri industry like, Cold Storages / modified atmosphere cold storages Warehousing facilities, Milk Chilling plants. Madhya Pradesh boasts extensive infrastructure to lead in the sector.
- **Automobile and engineering**- This sectors has spread across 2000 hectares and Pithampur auto cluster is one of the largest auto cluster in the country with more than 120 large units and more than 450 small and medium enterprises. National Automotive Test Tracks (NATRAX) a Complete testing facility to all vehicle categories as per Indian and global standards built to provide one step solution to major automobile players to test their vehicle's.
- **Defense**- With an extensive need for defense manufacturing infrastructure,Madhya Pradesh provides readymade ecosystem for the purpose. India is the largest importer of arms and ammunition in the world. The defense ecosystem Madhya Pradesh possesses seems to have made great strides in introducing the element of self-reliance in the key strategic sector of defense. State has historical ordnance manufacturing sites of Katni, Jabalpur and I,trarsi and presence of companies such as BHEL, Punj Lloyd, Bharat Forge and L&T.
- **IT/ITeS and ESDM**- Madhya Pradesh has been making changes in its policies to support IT/ITeS and ESDM ecosystem with IT parks in Indore and Bhopal. The cost competitiveness of Madhya Pradesh in providing IT services, which is approximately 3-4 times more cost-effective than other states, continues to be its

unique selling proposition in the domestic as well as global sourcing market. In order to provide more investment in the sector , Up to 100% FDI is allowed in Data processing, Software development and Computer consultancy services; Software supply services; Business and management consultancy services, Market research services, Technical testing and Analysis services, under automatic route

- **Pharmaceutical and Healthcare** – State has established pharma clusters at Indore, Bhopal, Dewas, Mandideep and Malanpur with Pithampur SEZ being a major manufacturing hub.
- **Renewable Energy-** Renewable energy capacity of MP has increased fourfold to reach over 8,100 Mw in 2019 – 2020.MP is emerging as a solar power hub with an installed solar power capacity of 1,882.32 MW as of October 2019. In December 2019, the government announced setting up a 2,000 MW Solar Power Park in the Bundelkhand and Chambal regions.From April 2019, Rewa Ultra Mega Solar Limited (RUMSL) in Madhya Pradesh started providing 27 megawatt of solar power to Delhi Metro Rail Corporation (DMRC).
- **Textile** – Textile industry is one of the key sectors of Madhya Pradesh. The state is one of the major cotton producing states of India. In 2018-19, cotton production and silk production in the state reached 24 metric tonnes and 100 million metric tonnes, respectively. Exports of cotton yarn stood at US$ 224.72 million in 2019-20 and formed around seven per cent of the state's total exports during the year. Indore, Bhopal, Dhar, Dewas, Ujjain, Gwalior, Khandwa, Burhanpur, Jabalpur are the major textile centers in the state. Readymade garment industry cluster at Indore houses more than 1,200 units with an apparel designing center at Indore SEZ.To attract investment into the textile sector, the government has provided an interest subsidy for five years at the rate of 5 per cent for textile projects and 7 per

cent for composite textile projects. Furthermore, the government provided 100 per cent assistance in plant and machinery for eight years under Industrial Investment Promotion Assistance Scheme.

- **Tourism**- The state has 25 sanctuaries, 10 national parks, 6 project tiger reserves, 3 UNESCO world heritage sites and 2 jyotilingas. The state boasts a great network of hotels and restaurants that cater to a wide range of tourists and are presumable not heavy on their purse too.

1.3.2 Education Sector Profile

Madhya Pradesh is one of the fastest growing states in the country with a growth rate of more than 10%. To sustain and increase the present growth rate, it is necessary that the available manpower is technically trained and as per the demand in the international market. It is well known that the role of trained, skilled and productive man-power in technical sectors is paramount for overall development. In the current global scenario, the state government has played the role of a positive catalyst in ensuring the availability of ever-increasing demand of skilled manpower in the State and the country. As a result of this, it has been made possible to set up 1357 Technical Training Institutions with an intake capacity of 258333 and the state has emerged as an important educational hub in the field of Technical Education and Vocational Training.

As per the data of the Labor Ministry, the state stands at the 11th position in the country on the total number of seats available in the Government and Private ITIs. The short-term training programs are in great demand in the state and currently there are only 135 Skill Development Centers (SDCs) and Vocational Training Providers (VTPs) providing short term courses. This has also been repeatedly emphasized by

the Human Resource Development Ministry and AICTE, that the development of Technical and Vocational Education in the state requires immediate action so that the youth of the state can take advantage of the opportunities arising on account of economic development. In the opinion of the several national level industrial organizations, the man-power currently being trained by the Technical Educational Institutions is not as per the demand of the market and industry and the quality is also not of expected level.

Although, there has been a sharp increase in the technical educational institutions offering graduate and post-graduate level courses in the state, but the number of institutions, number of courses, availability of seats and intake capacity at the Polytechnic and ITI level, has not increased in the same proportion. Thus, there is a need for a policy that promotes a balanced and integrated development of technical education at various levels.

Type of Institution	**Number**	**Intake Capacity**
Engineering / Architecture College	217	99262
Industrial Training Institutes (ITIs)	499	61130
Skill Development Centres (SDCs)	135	37200
Polytechnic College	143	27499

Source: Technical Education and skill development policy

(govt. of Madhya Pradesh)

1.4 EMPLOYABILITY STATUS OF ENGINEERING STUDENTS IN MADHYA PRADESH

Employability refers to a new graduate possessing a set of skills and/or competencies that enable him or her to compete and secure employment, whether in formal employment, self-employment or any career (Harvey, 2003). According to Hillage and Pollard (1998), employability is about being capable of getting and keeping fulfilling work. In a broader context, employability is the ability of an individual to attain and continuously secure employment sustainably within the labour market and thus realize one's potential. Set of skills and behaviour that is necessary for every job. Attributes that help individual Sustain and Progress in his/her work. Employability skill is one of the skills that will be valued by employers other than technical skills before being employed. Graduates mastering technical and employability skills have a better chance to fill the position offered by the employer. Earlier called soft skills but soft skills focused on personality development, Employability skills focus more on acquiring skills essential for a job (Dr. Urvashi Kaushal, 2020). As per the skills India report 2021, it had been seen a drastic change in the hiring intent from 2015 till now. The engineering sector is more employable domain with 46.82% in 2021 as compare to others.

Since 2015 Madhya Pradesh was never among top 10 states even to be included in the states with maximum supply of employable talent. This is because though we have many graduates passing out every year, but consistency is seen among their skills. Due to many issues the students cannot grab the opportunity expected by them. Continuous possessing of same skills and not matching the demand of the industry creates a gap between engineer graduates and the placement.

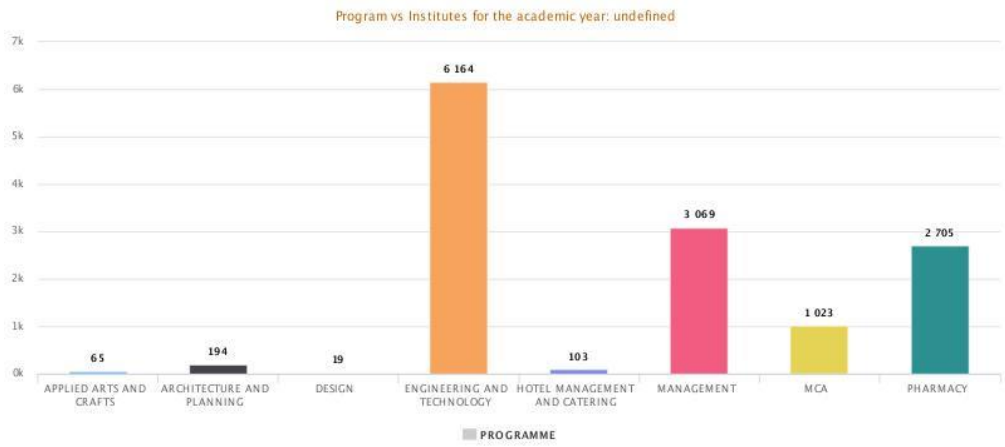

Figure 1.5 Source: Aicte-india.org

The above graph shows that the maximum number of enrolments in an academic year is maximum in engineering and technology as compare to other programmes. This shows that engineering and technology is the program where students get enrolled every year at highest level, but if look at the data, their placement is very low. As per AICTE report 2021, in the year 2018-19 there was 186 engineering institutes in Madhya Pradesh, in which the total enrolments were 42125 out of which only 19056 was placed, whereas in the year 2019-20 there was 176 engineering institutions in which the total enrolments were 38153 out of which only 20109 was placed. This shows that there are ample number of colleges that are offering engineering courses in their institutes and the intake is satisfactory for any state to continue with the course. The question here is the placement of the students opting for the course. Why are they not getting the opportunities as expected with the engineering graduate? One of the reasons can be the gap between demand and supply of the skill the students possess and industry needed. due to this mismatch of the skills the gap is increasingly widely which creates an impact on other students that engineering has lost its scope over the

time. But the reality is unknown which says an engineering graduate can never sit idle at home and never have lack of opportunities forever. Here I would like to put some light on our education system. The education system and skilled workforce are the key weapons for a country in facing global competition (Mustapha, 2011). Education helps to get the knowledge of the subject whereas skills are needed to grab the career opportunities. The above data reveals that the knowledge is delivered to the students but the lack of skills are lacking behind to grab the opportunities. If we look at the data of 2020-21, there are 179 institutes in which the intake was 72201, but due to covid-19 it turned out to nil. As per the committee headed by the chairman BVR Mohan Reddy, there are large numbers of vacant seats in the past few years and the likely future demand; the council shall not grant approval to new technical institutes at diploma, undergraduate, post graduate level in engineering and technology. The committee noted that 50 per cent of the seats were vacant in 2019-2020, 518 engineering colleges were closed between 2015 and 2019.

Therefore, it is clearly estimated that though we have all the resources and opportunities, students lack in the skills demanded by the industry. There can be many reasons to support the statement, such as family background, educational environment to the student at home, educational literacy of other family members, individual perspective of the student to learn new skills and so on. There are many students who are not bother to attend classes or even serious towards the studies, due to which they cannot get the job. Apart from students will, the education institute is also important. Proper allocation of resources to the engineering students with practical implications of the concept is also needed. Appropriate training and internship would do wonders in adding new skills to the students. Here it can conclude that instead of opening the institutes in bulk it would be better to have a quality education to every student who

take admission, and in addition the students also grab the knowledge imparting to you by the professors in order to polish the skills one possesses.

1.5 CONSEQUENCES OF SKILL MISMATCH

Engineering was essentially referred to as the most coveted and sought-after professions both in India as well as globally because of the basic reason that engineering can be termed as the backbone of any economy. Thus, it becomes essentially important to have a workforce that is skilled and relevant for whatever the future may hold for an economy to prosper. India has been raveling with high degree of engineering outflows but in contrary, it's not the problem of plenty but a problem of few conversely. The outflow is high but the skills that engineering graduates possess do not hold any relevance which is essentially the heart of the problem. An economy such as India should be on the forefront of technological revolutions but due to effective mismatches of skills in engineering graduates it is lagging. Another important problem or consequence of mismatch of skills in engineering graduates is the outflow of engineering graduates is so high that the economy is simply put not capable of absorbing the supply which gives rise to the unemployment levels. It becomes a never ending spiral trap wherein due to mismatch of skills and increase in supply of graduates, engineering as profession loses sheen and graduates look for opportunities in other fields rather than engineering altogether. This has also led to the closure of various engineering institutes throughout India as well as in Madhya Pradesh. Engineering Institutes are often faced with serious repercussions due to low employment opportunities as the organizations have clamped down the recruitment of graduates year after year due to lack of skilled graduates available.

There are certain societal consequences of skill mismatch too that have been cause of concern. Drug Abuse, Increase in Suicide attempts, Alcohol abuse, increase in mental and healthcare problem, all have their roots intertwined with the problem of mismatch of skills in engineering graduates. The societal consequences of this problem are far too large to ignore and there is an immediate need to take necessary actions to the students overcome these problems. Hence it is necessary to take steps to reduce these untoward consequences.

1.6 EDUCATION SYSTEM IN INDIA

1.6.1 Higher Education

Human capital is one of the most important assets of a country and a key determinant of a nation's economic performance. An increase in the human development index would lead to high levels of economic growth of the country. There is widespread recognition that skills and human capital have become the backbone of economic prosperity and social well-being in the 21st century. In contemporary knowledge intensive economies and societies, individual and societal progress is increasingly driven by technological advances. Adam Smith (1776) pointed out that a "man educated at the expense of much labor and time may be compared to one of those expensive machines" (Smith) and other classical economists observed that expenditure on education could be regarded as a form of investments that promised future benefits. Therefore, education is recognized as one of the critical elements of the national development effort. In this context Dill and Van Vught, (2010) said that higher education represents a critical factor in innovation and human capital development and plays a central role in the success and sustainability of the knowledge economy. Also, as portrayed in a recent OECD review of tertiary

education policies (OECD, 2008), higher education has become increasingly important on national agendas and has undergone profound mutations and reforms worldwide over the past decades.

As far as India is concern, the indian education system has conquered a strong position in international circuit. Next to China and United States, India has the third largest higher education system in the world in terms of size and its diversity and largest in the world in terms of number of educational institutions.

After independence, Indian higher education attained a massive growth In the Indian system, higher (tertiary) education starts after 10+2 (i.e. ten years of primary and secondary education flowered by two years of senior secondary education).Framework of higher education in India is very complex. It includes various type of institutions like universities, colleges, institutes of national importance, polytechnics etc. Universities are also of different types like central universities which are formed by Government of India, by an act of parliament which are responsible for arranging and distributing resources required by University Grants Commission (UGC), State universities, Deemed universities (aided and unaided) and Private universities. India has a federal set-up and the Indian constitution places education as a concurrent responsibility of both the central and state. India possesses a highly developed higher education system which offers facility of education and training in almost all aspects of human creative and intellectual endeavors: arts and humanities; natural, mathematical and social sciences, engineering; medicine; dentistry; agriculture; education; law; commerce and management; music and performing arts; national and foreign languages; culture; communications etc.). With all these developments the last two decades had witnessed unprecedented growth in institutes of higher education primarily due to private sector participation. The private

sector is expected to provide useful contribution in achieving the target of 30% GER by 2020 set by government of India.

The other important policy initiatives in higher education include programs for general development of universities and colleges; special grants for the construction of hostels for women; scholarships to students, scheme to provide interest subsidy on educational loans for professional courses to ensure that nobody is denied professional education on account of financial wherewithal and making interventions to attract and retain talent in the teaching profession in the higher and technical education. Emphasis has been laid on expansion with equity, use of ICT in education, promotion of research and quality education.

Education is recognized as one of the critical elements of the national development effort and Higher education is of vital importance for the nation, as it is a powerful tool to build knowledge-based society of the 21st century. The Indian education system has conquered a strong position in international circuit. Next to China and United States, India has the third largest higher education system in the world in terms of size and its diversity and largest in the world in terms of number of educational institutions.

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Moreover, the other important policy initiatives in higher education include programs for general development of universities and colleges; special grants for the construction of hostels for women; scholarships to students, scheme to provide interest subsidy on educational loans for professional courses to ensure that nobody is denied professional education on account of financial wherewithal and making interventions to attract and retain talent in the teaching profession in the higher and technical education. Emphasis has been laid on expansion with equity, use of ICT in education, promotion of research and quality education.

But as per the Times Higher Education survey report, the best Indian institutions are generally characterized by relatively strong scores for teaching environment and industry income, but perform poorly when it comes to international outlook in comparison to both regional and international counterparts.

Therefore, there is an urgent need to revamp the Higher Education system of India in order to absorb and make the talent employable in the era of knowledge economies. Interventions are required both at the micro as well as macro level in order to make the Higher education system of India more flexible and accolade to the Higher Education system of countries such as Norway, Sweden, Finland, Denmark, countries which have consistently worked upon their education system and present world class case studies for an education system that is flexible and cater to the needs of Knowledge economies of 21st Century with prime focus on Skill building. The teaching pedagogy used in the engineering institutes must be calibrated in accordance with the best practices of teaching used by the global hubs of engineering education. The prime focus of Higher Education must be upon providing a flexible approach towards teaching with practical exposure and skill building as its byproducts. So, it is necessary that the education provided by India's Higher education institutes must be in line with Best practices of Global education.

1.6.2 Technical Education

Technical education includes degree and diploma programmes in engineering, technology, management, architecture, town planning, pharmacy, hotel management and catering technology. Sectors relating to the above fields have an impeccable hand in the growth of India over the years and will continue to provide output for both substantial as well as sustainable growth of the country. Globally technical education has been going through tectonic shifts with the changing needs of the 21st Century. It is thus of great importance that India must take lead in educating and training professionals in cutting-edge areas that are gaining importance such as artificial intelligence, 3-D machining, big data analysis and machine learning among others in technical education, genomic studies, bio-technology, nanotechnology, neuroscience

and so on in the sciences. It is important to understand that rapid globalization, work power mobility and developments in information and communication technology have changed the whole fabric of technical education. European Union has consistently focused on the above points to design its Education policy: more specifically its technical education policy.

Since its foundation, the European Union has identified its goals and strategies towards technical education and has traveled a long way with cooperation studies among member nations to realize these goals and strategies.There are improvements and changes in technical education in concordance with continuous technological and social changes. In those changes and improvements, it is proposed that financial support must be oriented towards technical education and that the administration of technical education must be centralized. Besides all these, the following can be stated as general tendencies in those countries: the coordination of school education and enterprise education, generalization of technical education, the participation of social parties not only to the application but also to the school education, the coordination of general education together with theoretical and applied technical education, the notion of improving the skills needed in the workplace and reflecting that notion in the programs. General tendency is to think full-time technical education as a step and to build applied education on it and especially by taking the European Union principles into account, to establish continuous education structures that will enable lifelong learning.

In India, the aim of higher education is to provide access, equity, quality, and accountability at affordable cost to all aspiring Citizens with utmost transparency so as to ensure sustainable economic development of the nation. The beginning of formal Technical Education in India can be dated back to the mid-19th Century. The major

Policy initiatives in the pre-independence period included appointment of the Indian Universities Commission in 1902. Significant developments include:

- Constitution of the Technical Education Committee of the Central Advisory Board of Education (CABE) of 1943;
- Preparation of the Sergeant Report of 1944; and
- Formation of the All India Council for Technical Education (AICTE) in 1945 by the Government of India

The AICTE was set up in November 1945 based on the recommendations of CABE to stimulate, coordinate and control the provisions of educational facilities and industrial development of the post war period. At that time, mandate of AICTE basically covered only Programs in Engineering and Technology.

It was in this context that AICTE was given statutory powers by the AICTE Act of Parliament in 1987, with a view to ensure the proper planning and coordinated development of Technical Education System throughout the Country. Technical Education in this context includes fields of Engineering and Technology, Pharmacy, Architecture, Planning, Applied Arts and Crafts, Hotel Management and Catering Technology and Management.The AICTE Act, 1987 was passed by the Parliament, to provide for the establishment of the All India Council for Technical Education (AICTE) with a view to ensure proper planning and coordinated development of the Technical Education System throughout the Country, qualitative improvement of such education in relation to the planned quantitative growth and the Regulation and proper maintenance of norms and standards in the Technical Education System and for matters connected therewith.

The vision of AICTE is to provide a World Class Organization leading Technological and Socio-economic development of the Country by enhancing the global competitiveness of Technical manpower, by ensuring high quality Technical Education to all sections of the Society. The main objectives are:

- Promotion of quality in Technical Education
- Planning and coordinated development of Technical Education system
- Providing Regulations for maintenance of norms and standards.

In India AICTE is the prime body that is responsible for providing quality technical education and has been doing so since independence, although AICTE came into existence a long time back it has been contemplating itself with the changing façade of education. It is quite evident to suggest that there is a lot that needs to be done in this respect to cater to the needs of the changing landscape of technical education.

1.7 STATUS OF TRAINING IN ENGINEERING DISCIPLINE

Training can be defined as the systematic and gradual improvement in the body of knowledge, skills and attitude required by students or employees to perform successfully a given task or job. Moreover, training helps individuals to gain new skills and insights eventually opening new spectrums of knowledge. According to Abiodun (1999) the most valuable assets of any organization are the human resource. Without man-power nothing gets done with the machines, materials, and money.

In the similar view Robert H Rouda & Mitchell E Kusy Jr stated that (1989) that training is a learning process directly tied to specific situational results. The focus is usually based on improving individual and group behavior and performance, and on results to the organization. In this support of Dr. Carter McNamara(1998) said that

training is an activity when an expert and learner work together to effectively transfer information from the expert to the learner to enhance a learner's knowledge, skills or attitudes so the learner can better perform a current task or job.

Thus, it can be essentially concluded from the above statements that training forms an integral part of the learning process which helps to increase knowledge and skills for both the learner and the training provider which in turn leads to better performance by the workforce.

1.7.1 Role of training in education sector

Training plays an important role in providing skills and new insights for the students. It helps to provide a mode through which students can learn the concepts practically. Its, an approach where emphasis is laid on learning with the help of practical projects and is often highly regarded as an effective technique of permanent learning. Imparting education is not just a matter of learning but the focus is on gaining knowledge and enlightenment.

Furthermore, training not only plays a pivotal role in the development of students at college level but also focuses on school education. Now days, training in school are not only concerned with power point presentations and projects but with a variety of live problems that are solved by students which have dramatically increased the learning curve. The general nature of training has become more specific in providing knowledge to students. Thus, it can be concluded that training has become an essential component of the knowledge delivery mechanism at every level of education be it school education or college education. It serves the dual purpose of skill enhancement and knowledge upgradation by taking a practical approach which helps with the aspects of inculcating creativity and problem-solving skills in students.

1.7.2 Various types of training undertaken by engineering students

Training forms an important part of learning experience for engineering student. It helps to inculcate and develop knowledge and skills and forms the basis for new age learning. Various types of training an engineering student undergoes are as follows-

- **Summer Internship training**- It is quite evident that practical experience and working knowledge of theoretical concepts holds a great degree of importance in imparting much needed skills to students to excel in there chosen field of engineering. Thus to provide a hands on experience to students they are provided with 4 to 6 weeks of practical training known as summer internship training.
- **Live Projects**- Live projects are the way through which students work with a company in a real-time environment for a certain period of time during their studies.Live projects are basically to develop employment abilities in students and to provide industrial experience and insights. It's considered as the most pragmatic way for graduates to apply their knowledge in a real-time environment. And, it also allows them to understand how their jobs going to be like once they finish their program. The major takeaways of live projects are learning to be a team player, engaging with colleagues in a productive manner, rubbing shoulders with the bosses, understanding and aligning with the cultural values of the entity, among others.
- **Industry Sponsored training program**- These are the training provided by various organizations which acts as a bridge between corporate and the academic world. This training program offers various opportunities for students to work directly with industry on Live and Entrepreneurial projects. Industry projects give

students insights about latest trends in the corporate world and help them become competitive and ready for the real world.

- **Placement support training**- It is one thing to have knowledge and skills and it is another thing entirely to showcase knowledge and skills possessed by one. Thus, this type of training is provided with the focus on helping students cope up and excel at the placement processes that will open door to various types of jobs. The main focus behind this type of training is to help students showcase their skills in the best possible manner in the placement process.
- **Soft skills training**- This type of training usually helps students to learn various intricacies of interaction with people at the workplace. It Provides students with people skills that will increase efficiencies by better enabling people to work with each other. It helps them to increase their own efficiencies as well as the ability to influence others.
- **In House industrial training**- It is essential to provide students with practical exposure of various theoretical concepts that they learn in class room. Without the practical exposure knowledge gained by students will be ineffective and inefficient. Thus to full fill this objective engineering institutes provide various types of inhouse training of class room education.
- **Certificate courses training**- this type of training is gaining huge importance among students nowadays wherein the training organisation usually provides both training of concepts as well as certificate of training completion in a specified field which helps students to gain important skills as well as hands on experience.
- **Management and Entrepreneurial skills training**- The aim of this training is to provide students with various insights of management and entrepreneurship. These type of training helps to sow the seeds of leadership, imagination,

creativity, critical thinking and risk taking ability among others. In order to provide push for self-reliance, sustainability and perseverance, management and entrepreneurship training are seen as one of the key trainings for getting ready the future crop of entrepreneurs.

1.7.3 Key positive aspects of training

Training programs provide a great opportunity for students to expand their knowledge base and increase their efficiency and productivity at work. Following are the key positive aspects of providing training-

- Increased productivity- Training and development can help students perform better as they become more skilled in their job and are able to complete their work quicker than before. Moreover, training can increase the quality of the work and there is less wastage of time and money.
- Improve on weaknesses- A training program allows students to address various weaknesses and work towards getting better at them.
- Increased Motivation - Training and development can help increase motivation of students and create a positive and productive work culture. It is the responsibility of the administration to implement them in such a manner as to maximize the learning opportunities for students.
- Technology -Training helps to bridge the gap between technology and students. It helps them to learn various new technological advancements in their respective fields.

1.7.4 Training effectiveness: An overview

Training helps to bring about a visible and tangible change in the degree of Knowledge, skills and attitude accumulated over time. The first two are easily

measurable than the third due to their quantifiable nature. Knowledge, Skills and Attitude play an important role in today's extremely diverse and dynamic environment. There is a need for proper and systematic acquisition of KSA. The world has become hyper competitive with the focus on outcome based learning measuring everything against some yardstick to eventually focus more on feedback and control. This has changed all together how training is imparted with a richer focus on goal oriented training and measuring the effectiveness of training against the amount of Knowledge, Skills and attitudinal change imparted by it.

Kirkpatrick Model for training effectiveness

The main purpose of any training program is to fulfill certain goals and objective that are mainly concerned with an increase of Knowledge or skills and favorable attitudinal changes. The Kirkpatrick models thus helps to provide a framework which helps us to understand the development of the body of knowledge, inculcation of skills and attitudinal as a result of the training provided to engineering students.

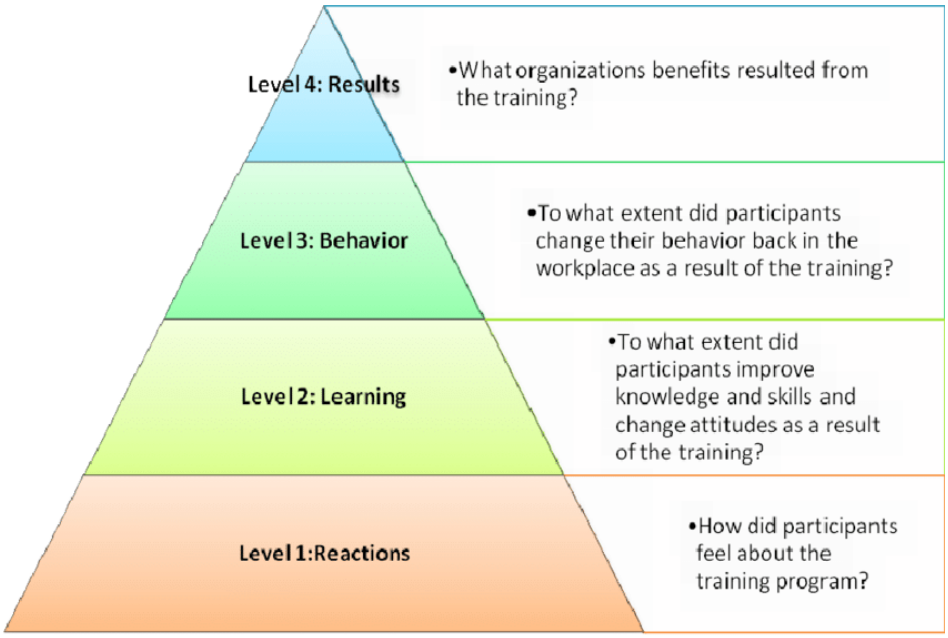

Fig.1.6.1 Kirkpatrick Model

According to Kirkpatrick (1998) the training evaluation process consists of a series of four levels. The levels, in order, are reaction, learning, behaviors, and results respectively. The first level is the Reaction level in which the reactions of the trainees are understood to mean the way in which they perceive and subjectively evaluate the relevance and quality of the training. According to Kirkpatrick, every program should at least be evaluated at this level to provide for the improvement of a training program. Learning which the second level is can be described as the extent to which the attitudes of the participants change, their knowledge increases or their skills are broadened as a consequence of the training. The third level is that of changes in job behavior or performance. This involves studying the change in job behavior which takes place as a result of the training. Level four evaluation attempts to assess training in terms of organizational results.

The Kirkpatrick Model is probably the most well known framework for evaluation of training programs. The framework designed by the model will be extensively used to adjudge and increase the effectiveness of the various types of training provided to the engineering students. It will help us to design better training programs for students that will systematically help to increase their Knowledge, Skill and Attitudes.

1.8 RESEARCH OBJECTIVES

1. To estimate the number of engineers and requisite skills demanded by industry among aspirants against supply
2. To identify the available employability skills in engineering aspirants.
3. To study the various factors responsible for mismatch between demand and supply of requisite skills.

4. To study the consequences of mismatch between demand and supply of requisite skills.
5. To study the employability of engineering campuses in Madhya Pradesh.
6. Assessing the effectiveness and appropriateness of training imparted to Engineering Aspirants.

1.9 LIMITATIONS OF THE STUDY

1. The primary limitation of this study is the number of participants in the survey.
2. In addition, engineering industries and institutes were taken for the study, other institute may be taken for further research.
3. Research was restricted to Madhya Pradesh region , other regions may be taken for further research.
4. First, the sample size of the study is sufficient but not large. Therefore, the results have to be evaluated in further research with a larger sample size. There are also limitations related to the measures that were used. The length of the questionnaire and the number of items were limited.
5. Incomplete data was also a limitation of the research.
6. COVID 19 period was the biggest limitation and constraint in the study.

1.10 CONCLUSION

Human resources are termed as one of the most important and inclusive assets that help to employ the highly propellant demographic structure. However, in the course of fully utilizing this advantage and eliminate the very possibility of skill shortage it is essential to revitalize education system through innovative initiatives. The skills available with employees in emerging world are in high demand with the first world

countries. Skills play an important role in increasing employability as well as job readiness with certain skills seen as the next generation skills that will change the very face of the industry.

In a highly dynamic environment, which is ever changing, graduates who have extensive skill set would often be more employable. It is thus necessary for students to be adaptable to the needs of job market. The skill set required quite often than not differ on various micro as well as macro-economic factors shaped by various socio-economic and cultural factors. However, certain qualities such as communication skills, interpersonal skills, integrity, right attitude, problem solving, decision making and team building skills can be taken as a few common skills of employability skills.

Madhya Pradesh is one of the fastest growing states in the country with a growth rate of more than 10%. To sustain and increase the present growth rate, it is necessary that the available manpower is technically trained and as per the demand in the international market. it has been made possible to set up 1357 Technical Training Institutions with an intake capacity of 258333 and the state has emerged as an important educational hub in the field of Technical Education and Vocational Training. Although, there has been a sharp increase in the technical educational institutions offering graduate and post-graduate level courses in the state, but the number of institutions, number of courses, availability of seats and intake capacity at the Polytechnic and ITI level, has not increased in the same proportion. Thus, there is a need for a policy that promotes a balanced and integrated development of technical education at various levels.

Education is recognized as one of the critical elements of the national development effort and Higher education, in particular, is of vital importance for the nation, as it is

a powerful tool to build knowledge-based society of the 21st century. The Indian education system has conquered a strong position in international circuit. The best Indian institutions are generally characterized by relatively strong scores for teaching environment and industry income, but perform poorly when it comes to international outlook in comparison to both regional and international counterparts," as per the Times Higher Education survey report. So, it becomes crucial to make the higher education more effective with a best practice of international scenario. Apart from higher education system there are many factors responsible for skill gap such as gender variants,

individual interest, environment, family pressure, finance assistance, industry adjustments of all the graduates which means there are situations whereby industries are not having vacancies for the respective sector, difference between industry requirements and curriculum for students, lack of new generation skills and abolition of old skills.

India is the country with vast population and people with different skills. Sometimes these skills are not utilized by the individual or are mismatch with their profession. This mismatch leads to many consequences which are not expected. In this study we have undergone many consequences which are observed due to this mismatch of skills as: closure of many engineering institutes due to less employment opportunities but ample supply of graduates by the institutes, irrespective of the skills they possess and demanded by the industry, graduates are lagging behind in the new generation skills which are required in the technological aspect, deviation of students to other programs and certified courses, lack of creativity and innovation as the interested aspirant may due to certain factors are not able to join the engineering program, lack of investment in education sector by the government. Apart from this there are certain social

consequences such as drug abuse, suicide attempts, alcohol abuse, increase in mental and healthcare problems.

Another important aspect of engineering education is the delivery of knowledge through various training programs which have been found out to be highly useful. Training helps to impart knowledge and skills in a more specific manner with focus on practical learning. It is also necessary to reflect upon the fact whether the training provided is effective or not. In order To find out the effectiveness of training program we use Kirkpatrick model of evaluation for different types of training provided to the engineering aspirants.

Hence this study will help to provide the loopholes amongst industries demanded and the knowledge students possess from the engineering institutes. This study will not only enhance the present scenario of engineering education but also provide a broad way for future sustainability in the market. Moreover the suggestions from both the industrialists and academicians included in our study will help to understand how the course must be designed for better and successful future of our technical manpower.

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CHAPTER 2

REVIEW OF LITERATURE

CHAPTER-2

REVIEW OF LITERATURE

2.1 INTRODUCTION

An ultimate and ideal situation for both the institute and the industry is to go in perfect synchronization. There is a persistent conflict over the requirements of the industry for engineering graduates with the tangible competencies they have acquired during their academic pursuit. Many studies have been reported in this vicinity from various countries including India. The present investigation is designed to identify and analyze these skill requirements as they exist among the graduate engineering students, and it explores several issues of direct relevance to this study - industry needs, graduate engineers' technical skills and soft skills.

The reviews presented in this chapter are drawn from previous studies reported by researchers on the industry requirements, job skills and professional skills. The reviews comprise Indian and foreign studies on the topic of the present exploration. The analysis covers current literature that includes a variety of sources:

1. National and International Journals, 2. Papers of Conferences, 3.Ph D thesis of the UGC Web Portal (Shodhganga), 4. E- Sources of Web Portals, 5. Reports of Professional Societies.

2.2 MISMATCH OF DEMAND AND SUPPLY OF EMPLOYABILITY SKILLS

1. Elisabeth T. Pereira (2019), the researcher discussed the essential need to improve the level of skills and employability for graduates. The researcher also

analyses the need to improve level of skill sets that the graduates in Europe possess. A questionnaire was used by the researcher to achieve the objectives of the study. IBM SPSS 23 was used to conduct statistical analysis. Preliminarily univariate analysis was applied in order to profile students and identify the skills that are student's lack. Then bivariate analysis namely t –test, was applied by the researcher in order to identify important differences between two groups. At last ANOVA test was applied to conduct multivariate analysis, in order to find out differences between more than two groups. The Bonferroni test was also conducted in order to find out essential differences between each pair of groups. The results suggested that students ought to lack mostly in personal, interpersonal, entrepreneurial, communication and intercultural skills. The researcher concluded the need for a collective approach by both Higher Education institutes and students to essentially work upon the aspects such as communication, entrepreneurial skills, intercultural adaptability and interpersonal skills.

2. Mahtab Pouratashi et al (2019), the researcher analyzes the need for inculcating employability skills in graduates to align them with the needs and changes of labour market and increase their employability. The main objective of the study is enhancing the employability skills of students in Iran. The study was carried out in three stages. Qualitative method was systematically used for the first and the third phase and quantitative method was used for the second stage. In order to identify major employability skills, Delphi techniques was used. The information then collected was transformed in a structured questionnaire. Questionnaire was used for collection of information in second round. After identification of major employability skills in the first stage, the second stage

involved faculty members at university of Tehran. The faculty members were asked to register their responses on a Likert scale of 1 to 5 about these employability skills. The third phase consisted of using the Delphi technique to find the agreements and disagreement, opinions and judgements regarding the skills. The common skills that were identified in the first stage were grouped in three categories namely basic skills, intermediate skills and advanced skills. Factor analysis was conducted which suggested that amongst the basic skills, responsibility and oral and written communication were the most important skills. Critical thinking was most important among intermediate skills. Lifelong learning and networking were seen as most important skills among advanced skills. The researcher concluded that a comprehensive approach must be followed by the policy makers in order to inculcate employability skills that are highly necessary for enhancing the competency of graduates.

3. Siti Zaidah Binti Zainuddin et al (2018), the researcher analyzed the necessity for English proficiency and its implications on the employability. The study makes use of questionnaire in order to collect data. The data was collected swiftly in two stages involving semi structured interviews with 12 human resource personnel and 12 managers of different organizations. The second stage of data collection involved distribution of questionnaire to 97 third year and 255 final year undergraduates. The researcher concluded that communication in English is an essential skill for better employability.

4. Rekha Attri et al (2018), the researcher discusses the need for certain traits and employability attribute that the corporates look for while recruiting. The researcher analyses the mismatch that is created as a result of the way students are groomed by the educational institutes and what corporates really want. The

researcher conducted an exploratory research of 445 students that have either passed or are pursuing the two-year business management program from 2012 to 2016. Multiple Regression analysis was used to find out impact of different independent variables such as projects, communication skills, attendance of students and participation in various co- curricular activities. The researcher was able to find that the key aspects that determine or affect the employability of students were basically the live industry projects, ability to communicate, academic performance of the student and various co- curricular activities that the student participated in.

5. Lucia l. Llinares-Insa et al develops a study on Employability Appraisal Scale (EAS): development and validation in a Spanish sample in 2018 proposed a multidimensional employability scale that analyzes both individual indicators and personal circumstances from the Bioecological Model of Employability. The Employability Appraisal Scale (EAS) assesses personal and social dimensions of employability. It was developed and tested using data from 489 people (unstable workers, professionals, prisoners, long-term unemployed, socially excluded, etc.). Results provided evidence for the multi-dimensional structure and validity of the EAS. This scale is a valid and reliable instrument to measure employability, and it provided criteria for interpreting scores. A theoretical and practical implication of the EAS for social and labor integration, job transition, and career development had been presented. Findings had a positive implication for identifying effectiveness indicators in training programs, and they contribute to designing intervention policies to increase employability. This paper developed and validated the EAS, and demonstrated its good psychometric properties, based on the Bio-ecological Model of

Employability. The EAS had 35 items that appraiseemployability, confined under; protective employment behaviors, employment risk, job-seeking behavior, self-control, and self-learning. The findings would be used by researchers, human resource services, and social workers to examine the employability of workers/unemployed people and design intervention programs. Employability would integrate individual and contextual variables, and we use the four components (proximal processes, biopsychological characteristics of a developing person, parameters of the ecological context, and the temporal dimension), proposed by Bronfenbrenner's Bio-ecological Model of Employabilityto develop a holistic definition of employability. The bio-ecological perspective considers employability to be the result of personal and contextual factors, combining individual characteristics and proximal processes. With this model, we consider employability to be a personal Metacompetence (first key element), but, at the same time, a social construction.The second key element of employability involves approaching it as a social construction. Employability must be considered within the context of a particular social system, and it is a product of social regulations and power relations among social groups. From this perspective, employability is a process that builds on the individual and group history of individuals and societies.

6. Nidhi sehgal et al (2018) suggested some technical skills which include technical specialties knowledge; technology management as microvariables organizational skills, personal and interpersonal skills as macro level variables includes creative thinking skills, problem solving, communication, critical thinking skills, team work and interpersonal skills as micro level variables. Total interpretive structural modeling (TISM) had been implemented to predict

graduate employability for IT sector. This process helps to understand the contextual relationship between these elements. In this process a graphical representation of elements with significant transitive links are drawn and their interpretation are placed in the boxes. simple random sampling method is used to pick up the member from the companies of NASSCOM and questionnaire had been filled via personal interviews and sending mails.

7. Su-Hie et al (2017) focused on the perception of the employers on communication skills and proficiency in English speaking in Malaysia. The researchers tried to explain the importance of speaking English and good communication skills. The data to find out the above research was collected from semi-structured interviews within 10 employers of a private organization and was in designation of placements in the firm. The companies were: animation, pharmaceutical, bank, three insurance companies, telecommunication, and mobile app Development Company, Construction Company, oil and Gas Company. The researchers explained that why English is important in any firm; (i) to understand others, (ii) to make oneself explainable to others, (iii) to communicate in group. The employers perception produced certain outcomes as: employers provide a chance to the average graded student in English to prove themselves in interview, but some with broken English get placed due to their confidence to express themselves, secondly graduates in university need to possess a good communication in order to posses the advance exposure. The researcher advised that the universities must introduce a course on good communication skill for students in order to cope up with the current market trends and meet the demands of the organization.

8. Dr. R.R. Chavan (2017) stated that the concept of employability skills need to be explained before analysis and the survey was carried out to develop an employability skills model for graduate students. The employability comprises communication skills, problem solving skills, self-management, time management skills, decision making, planning and organizing, creativity/innovation skills, independent study, analytical skills, team work skills, ICT skills, leadership, honesty and integrity, self-confidence. Data was analyzed for reliability analysis (Cronbach Alpha), and undertake an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) of the employability skills scale. Thus, the measurement model was suitable to be used to study the employability skills acquired by students as per reliability of more than 0.8. Factor analysis yielded 42 items model. The model emerged as the perfect fit on various indices and can be used in measuring of employability skills among the graduate who apply for jobs in various organizations.

9. JyothirmayeeRamisetty et al (2017) the researcher discussed the relationship between job readiness of a student and the employability skills. The researcher also analyzed the need for formulation of a tool that could help to measure the employability skills and job readiness among students.Statistical analysis was carried down with the help of SPSS software. Non probability sampling technique with cross sectional design was used to determine factors wherein five major scales were identified mainly- Communication Skills, Personal and professional advancement, Adaptation skills and flexibility, Intellectual and Technical skills, and Understand Organization's vision and development. The initial step in development of scale was to collect the items from a group of items. The second step constituted the use of Pearson coefficient of correlation

in order to know the relationship between each scale. Items that did not had a strong correlation were removed. Correlation matrix was the used to perform factor analysis. Factor analysis with Eigen values more than 1 was considered. Cronbach alpha reliability was used to check the reliability. The researcher concluded that only through the determination of set of skills important for employability, we can really promote employability as a valuable outcome of higher education.

10. R. Mary Metilda (2016) analyzed the perceptions of the employer on how job fit is fresh business school graduates in the Indian business scenario. The responses of employers on skills considered in the recruitment of management graduates, matching to their business profile as well as job profiles, were compared with the actual skill set of fresh MBAs inducted from the higher education sector. This study also investigated the level of importance of skills required by a new business graduate from the employer's expectations of different sectors. A 'skill gap' between actual and expected was identified from these findings and its impact will be an eye opener for Business education programs. This is a working paper based on classification of employability skills based on Holland's Job-fit theory. The study reveals that there is substantial dissatisfaction with the quality of business graduates in the practical level. The survey said 86 percent of employers concurred that MBA-hires doesn't create much value for their companies in their first few years of their career stage. This confirms the finding that the skill set of fresh managers is inadequate. There will be drastic changes in the Job market and the need of the skill sets may vary again and again. The results of this study make a valuable contribution to the field of career

development/guidance, individual students of business studies, employers, and higher education institutions.

11. R. Mary Metilda et al (2016) suggested that there are many surveys in 2001-2014 by economic survey for 2013-14 which ensures that India has the second fastest growing services sector with its compound annual growth rate at nine per cent, just below China's 10.9 percent, during the last 11-year period. There were several studies conducted in India to know the employability skills of the students. It is found that 75% of the Indian graduates are unemployable (Talent shortage survey, 2005). Globally, about 34% of the employers find it difficult to fill the talent gap and in India 67% of the employers find it difficult to find the right talent in India (Management graduates). The employability analysis is based on 'Job fit' theories. This theory is sub-categorized into person-environment (P-E), person-organization (P-O), person-person fit (P-P), person-group fit (P-G), person-vocation (P-V), person-job fit (P-J). This paper analyzed the responses on the basis of USEM model in which U is understanding, S is skills, E is efficacy, M is meta cognition. The author had categorized the 42 skills under the category as: Person-person, Person-vocation, Person-Job fit. In P-P all personal attributes are considered. With the help of factor analysis, significant skills of P-V and P-J are analyzed. On the other hand, student's performance level of employability and employer expectation was compared using T-test. Holland's theory was also being considered by the author. The theory provides a broad and logical set of constructs for use in the assessment of career and vocational issues. This theory was considered as nowadays vocational issues are being considered day by day. The purpose of this study was to investigate the gap between the employer's expected skill sets of

business graduate and the actual skills they possess at the time of recruitment.A questionnaire survey was conducted among the employers in different segments in South India. In the questionnaire, the employers were also asked to indicate the level of importance they placed on the skill set required by the graduates, entering business roles. The ratings were based on responses to an eleven-point Likert scale, ranging from 0 (insignificant) to 10 (most significant), denoting zero as the "no skill" and ten as the "highest level of skill".The skill set of the students was measured through placement officers of different B schools using a two-level assessment – self assessment using an instrument and the score the students gain in different recruitments in aptitude, personal interview, group discussions, general personal assessment and technical interviews. The reliability is measured under Cronbach Alpha and KMO test.

12. Alena Y. T. Tan et al (2017) published a research paper that aimed to identify the demand of the market and what is expected by relevant stakeholders (such as employers, academicians and accredited bodies) so as to decline the unemployment and fulfill the demand and new requirements. With the findings of this research suggest all the relevant to work in accord for relocation by conducting numerous review and updates on the manual to make sure relevancy of at present expected graduate attributes. The study also suggests for a different educational method to be adopted in relation to how engineering programs will be conducted in the past. It is acknowledged that this study may be relevant to the engineering sector and not for the other disciplines, but the qualitative part provides some important issues in understanding the gap between relevant stakeholders that may enhance future studies into the other disciplines.

13. Sunardi et al (2016) analyzed the employability skills in students. The researchers stated that apart from technical skills, academic skills some other non-technical skills are needed to transfer in to different fields work, required to enter in a workplace, for career development and remain on the job. The skills are listed as: communication skill, teamwork skills, problem solving skills, initiative and enterprise skills, planning and organizing skills, self-management skills, learning skills, technology skills, health and workplace safety and personal qualities. These skills were considered as per the confirmatory factor analysis with **lisrel** value of more than .8. Based on the analysis, it is known that the evident variables are valid in explaining the employability skills constructs variable. This states that the reliability of the measurement of hidden variable models of employability skills is very good. It can be concluded that the measurement model is suitable for studying employability skills of vocational mechanical engineering students in South Sulawesi. The model does not provide a framework for analysis of current trend of outsourcing and off shoring in labor market.

14. Chris Corker (2015) presented a step ahead for students to let them know the employability, skills and reflection from our experiences of working with history students during their first year of study. This also includes a module which incorporated an independent research project. As a part of this project, two lectures, a single workshop and an assessment task related to employability are included. In addition, a survey results and evaluation related to first year students' perceptions of skills and employer's needs, and their own perceptions of the skills they have developed during the module. Overall, an active and relevant approach in order to introduce students to employability within their

first year at University is taking place. By taking a view on employability skills, it is possible to deliver an appropriate content not only to those who are certain about their future but to all other students.

15. John M. D. Calhoun (2015) had laid down a foundation for research in skills mismatch in the context of Canada. He had focused on all three domains of skill mismatch especially in Canada. The most considerable predictors in terms (domains) of numeracy, problem solving and literacy of skills mismatch are individuals with higher levels of education, and individuals with guardians and parents that have higher levels of education. This study develops a potentially informative measure for skills mismatch in the Canadian context using PIAAC data. Earlier Allen Perry method was used but the author uses hybrid method to make a standardized comparison of each respondent to assess the level of skill and skill used at work. Author had reviewed many theories as: human capital theory, technological change theory, career mobility theory, search theory, signaling theory, assignment theory in the background to apply tools on the variables. To estimate the hidden variable item response theory (IRT) is applied. To measure tools PIAAC data uses delete-one jackknife (JKI) replication method and multiple imputation approach for plausible values to derive appropriate weights and variance estimates. The two approaches: self-reported and direct approach are used to know how their skills match with the required skills and can be measured through self-reporting or by occupation specific skill level. The variables such as: literacy, numeracy and problem solving are further categorized as over skilled and under skilled and the data collected are drawn on 5-point likert scale with a reliability test Cronbach Alpha being used. After this, multinomial logistic regression is used.

16. Lucy Bailey et al (2015) suggested that institutions with huge number of students and staff from worldwide need to emphasize on understanding the contending concept of employability. The data was collected from both the faculty and students of different courses. The findings suggested that international employability deserve a better unambiguous thought amongst programs targeted to international and national students. This paper examined the conceptions of international employability in the campus of Malaysia. Contrasting the perceptions of both, lecturers and students, employability is unclear, evolve and distinct concept. This paper suggested that universities with large numbers of students studying from abroad and staff need to give more attention to understanding challenging ideas of employability. Furthermore, universities with nationally diverse student bodies may need to develop multiple employability curricula to meet their varied needs.

17. Sharmin Mahmud (2014) examined a mismatch in skills and attributes of immigrants considering the problems with workplace integration: a study of IT and engineering professionals in Australia. The immigrants from engineering background and their employers from one private sector and 3 public sector organization in Australia are chosen for the study and are based on qualitative research design. The author argued that the mismatch of English proficiency, qualification and culture are main aspects, due to which despite being skilled, immigrants are unable to meet the requirements of the employers.

18. Nitin Kulkarni et al (2014) conducted a study that helps to measure the employers' perspective on the basis of four major skills sets - Human Skills, Professional skills, Communication skills, and Technical Skills. Analysis of theprimary data showed that employers, across three industry sectors i.e.

engineering services, IT/ITes, manufacturingpreferred Human skills to any other skills measured with the help Eigen value. This study focused only on first level of elements like Human Skills, Professional skills, Communication skills and Technical skills - as a means to measure employer's preference. Further, these broad categories can be broken down into sub-criteria as defined by the Graduate Attributes (GA's) by the National Board of Accreditation (NBA) for undergraduate study. The result of such kind of study can help throw light on the specific skill gaps existing at the student / institution level. Further, recommendations can be made to bridge such gaps through - enhanced teaching learning process, curriculum design, project / practice-based learning- that help in enhancing the employability of our engineering graduates. It is concluded that, across three industry sectors chosen for this study, Human skills are preferred in making hiring decisions across various types of businesses to the extent of 42%.Communication skills with 26% significance, stood out as the second most preferred attribute for engineering graduates to be employable. Third rank with 18% significance to professional skills. Lastly Technical skills stood fourth in importance at 14% approval.In this study, it is indeed interesting to know that employers from across three industry sectors preferred technical skills the least in contrast with the other three skill sets while selecting a fresh engineering graduate.Providing reason that why the low skilled workers, less educated people would experience a bag of in their wages.

19. Keerthi menon (2014) published a thesis on employability of engineering students in Mumbai and Pune region with objectives to study the level of differences in employability skill with attributes and to suggest steps taken by institutes to inculcate these skills. Data was collected primarily through

structured questionnaire and interview from final year students, academicians of engineering institutes, recruiters of IT and manufacturing company (managers and HR heads). Z-test was implemented to analyze the data collected from engineering students. T-test is used for analyzing data collected from corporate. For academician's frequency distribution and pie charts are used. Apart from the above analysis the researcher had also introduced innovative programs like Special Assistance program (SAP), universities with potential for excellence (UPE), basic scientific research program (BSR), colleges with potential for excellence (CPE). At the end the author concluded that technical and high order skills can be developed in academics but other skills are developed by the students, academicians are not satisfied with the curriculum and not known with industry needs. The problem among young engineers is unemployability and not unemployment.

20. Venkatesh (2014) conducted an empirical study on the engineering student competencies for matching academia deliverables with respect to industry needs. Skills are categorized as technical/functional, generic competencies, managerial competencies. Under these heads there are other skills in which integrity, reliability and teamwork, specific-entrepreneurship, communication in English, and known to modern tools and techniques are most important and general skills that must be in every individual. An empirical research had taken place in various industries as IT, manufacturing, mining and petroleum, transportation equipment, steel, textiles, chemical, food processing, software and pharmaceuticals. Data had been collected from final year students, engineering faculties of various institutions, technical and HR heads of selected private and public organization. Questionnaire had been designed for students,

academicians and managers and analysis is done on the basis of non-probability sampling which includes both stratified and judgmental. The sample size of 1263 had been collected from various autonomous universities in Bangalore, Belgaum, Gulbarga and Mysore. Reliability test. Variables such as theoretical knowledge, soft skills, practical knowledge, positive attitude and technical skills are tested on Z-test and independent T-test. ANOVA helps in analyzing the gap between expectation of industry and what academicians are delivering them. Binary regression helps to influence the soft skills on employability of the student. Wald test helps to determine the ability of getting students placed. In the end the thesis concluded that more exposure to training for interviews, additional skills enhancement, important measures to impart soft and technical skills, guest lectures, seminars, conferences by industry experts will help the students to get placed in a good organization easily.

21. Shinde (2013) suggested a PBL model which means problem-based learning. The article stated a wide use of PBL in different countries and need to be implemented in Indian scenario. The PBL was implemented firstly in Canada at McMaster's university in1968. Thenin1974 it was implemented in Denmark at Aalborg University. PBL can be defined as educational strategies in which the learning of awareness skills and proficiency is organized around appropriate, ill-structured and reliable problems. It encourages the students to take up responsibilities and helps in taking the decision to get the desired results. Victoria university in Australia introduces PBL in 2006, suggested that only theoretical approach is not enough for students, practical implementation is also needed. Many further studies have reported a positive impact of PBL. Nearly 80 per cent retention is shown in a year with respect to project work as compare to

20 per cent leaning through lectures in the same time period. In India the approach of PBL is neither being recognized nor accepted officially. So, more researches and training must be designed to increase the acceptance of PBL by Indian educators. The author concluded that not much researches had been done in engineering in India, soothe concept of PBL is not being focused much, so to enhance the knowledge in the area of PBL, periodic conferences with proper legislation and jurisdiction must be considered.

22. Bartlett (2013) investigate the ability of educational system in European neighborhood policy (ENP) region in order to provide a skilled workforce, matching with the changing needs of labor market? An inverted-U pattern of mismatch had been identified across educational groups, especially those who graduated from vocational schools where the curricula are inappropriate to the market needs and funding for new equipment is relatively constrained. The study showed that in transition countries and Turkey graduates from professional institutes often have unsuitable skills and have trouble in finding a job. Whereas graduates from universities find jobs comparatively easily because reformation and technological change has led to raise the requirement of highly skilled workers. Demand and supply both have been increased of highly skilled workers. However, demand surpasses supply as 'skill biased technological change' in both service and manufacturing sectors led to a growing demand for skilled labor. ---Suitable changes had to be made in the curriculum, apart from this redistribution of subjects amongst teachers, school reformation and retraining of teachers had been suggested in the study. The research shows some problems of mismatch in European union and neighboring countries as: i) bonus and benefits to firms holding training for skilled workers, ii)transformation of

professional educational system, iii)special measures for women workers such as kindergarten for young children and provision for public nursery, iv) support to employ young skilled workers with the help of internships, v) measures to improve skill forecasts to professionals in career and support to school leavers.

23. Shamsuri et al (2013) published an article on the perception of employers', information and communication technology students' employability skills. This article illustrated the findings of a survey conducted on the students of engineering and ICT undergoing an industrial training at University Technical Malaysia Melaka (UTeM). The article helps to know the perception of the employer in knowing the employability skills of the engineering students by adopting future education report 2007 and a 13-itemscale from the engineering Accreditation council (EAC) manual. The article helps in identifying the requirements of the industry and helps the students to be equipped with those skills. Presentation skills, problem-solving and tool to handle competency are the main skills that are being demanded among the students by employers.

24. Leoni (2013) analyzed the unity between competency mismatches and the objective of European policymakers to transform the higher education system through the Bologna Process and the Dublin Descriptors, moving from the transfer of knowledge from the teacher to learning by the student and from disciplinary knowledge to competencies.The response of European policymakers to the technological and organizational shocks is the so-called Bologna Process.The Process is being developed in stages in different countries, monitored biannually by the Ministries of the signatorycountries through national action plans in relation to the prefixed objectives and the accumulated delays.The results of our estimates are consistent with a model according to

which the educational level of parents (regardless of the degree field) significantly influences some personality traits of their children (such as cognitive styles in progress, meta-cognitive factors,perception,self-image,self-esteem,values,generalculture),however, there is no automatism in the relationship between what parents offer (in terms of learning styles, culture, values, self-images, etc.) and what children learn.

25. Sumanjeetsingh (2012) identified what are the mismatch and gaps of skills and reasons behind these gaps in Europe. The paper helps to identify the key problems with development of e-skills, with an attempt to provide some tools to these European countries so as to able to handle the problems of mismatch, gaps and shortages of skills. The analysis depicted that only 30 per cent of IT professionals are available who are categorized under low skilled, medium skilled, and high skilled workers in Europe as compare to that in US. The researcher focused on developing e-skills in 21st century because today the information is run on internet. So, to be updated and utilize the information one need to have-skills. With the help of these skills the person is able to reduce efforts, save time, keep in touch, stay informed, easy communication, send and receive money, search jobs, easy bookings and travelling and so on.

26. Acemoglu et al (2011) presented a study on the skills, tasks and technologies: Implications for Employment and Earnings. He discussed a canonical model that demonstrated changes in the returns to skills and the development of earning disparity. The author suggested that canonical model lack in:

    a. Do not answer questions as why the significance of occupation as predictor of earning is escalating.

b. Do not distinguish between skills and tasks.
c. Do not provide a framework for the study of how new technologies will reinstate workers in certain occupation.
d. Do not respond to the changes occur in labor market.

27. Bender et al (2011) examined the evolution of mismatch and its importance over a career, with the help of scientists in the USA. The results illustrated that both the incidence of mismatch and its negative consequences appear rigorous among those delayed in careers. This suggested that past studies of mismatch may inflate the degree of inadequacy in labor market matching. The study makes it clear that mismatch is due to delay in careers. The respondents themselves have the option of identifying that their career or career stage is a reason for mismatch. The finding are reliable with much of mismatch being a result of career evolution. In general, the incidence, consequences, and duration of mismatch are suspiciously associated with workers late in their career. The findings are, concentrated late in career and may reflect both the natural evolution of those careers and perhaps the use of deferred compensation as a competent motivation device.

28. Andreas Blom (2010) conducted a research on the skill set and employability in new graduate employees. With the help of this research the author tried to find out the skills necessary for university graduates, the skill in which they are lacking, and are employers satisfied with the set of skills graduates possess. Total 26 skills were summarized under three categories: core employability skill, professional skill and communication skill. ANOVA is applied to test the importance of English in both large and small firms. The survey was conducted by FICCI, World Bank and NPIU. Large economic sectors such as IT, power

and water, infrastructure demand the graduates with soft skills in priority and technical with an average.

29. Jim Allen et al (2001) expressed their views on educational mismatches versus skill mismatches: effects on wages, job satisfaction and on-the-job search. Over education affect the labor turnover (Topel, 1986; Hersch, 1991) occupational choice (viscusi, 1979) and job satisfaction (Tsang and Levin, 1985). Pragmatic results recommended that both individual human capital and job characteristics are related to wages. Individuals working at a lower level of education than their own is required is termed as over education, whereas many are working on the same level as per their education, is named as adequate education. On the contrary, individuals working in higher level than their education are termed as under education. The wage effects of over education are stronger than wage effect of under education which is made known in support of assignment models whereas returns to additional investments in human capital depends on the match between worker and the job. Data had been collected from higher education and graduate employment in European countries and Japan. Again, it is divided into graduate from university and graduate from college for higher vocational education. The graduate data is sub-divided into: graduating from tertiary education in1990-91; and representative sample of those who graduated in 1994-95. Over education and under education are the variables measured in terms of number of years. Assignment theory had been tested in this article. Certain measures are considered as: i) how do skill mismatches correspond to mismatches between available and required in jobs of education. ii) How can wages affects educational mismatch be accounted for by skill mismatch? iii) To what extend and in what ways do skill mismatches and educational mismatches

influence job satisfaction? iv) In what way and up to what extend do skill mismatches and educational mismatches influence employees' decisions to actively seek other employment. The main aim of this article is to discuss the assignment theory with search, matching theory, and human capital theory by examining the relation between education, job-search and utilization of individual skill.

2.3 FACTORS RESPONSIBLE FOR MISMATCH BETWEEN DEMAND AND SUPPLY OF REQUISITE SKILLS

30. Ghassan Dibeh et al (2019), suggested the factors responsible for skill mismatch in Lebanese youth covering people in the age bracket of 15 to 29 years. The researcher discusses the role of higher education on minimizing the skill mismatch. The researcher uses SAHWA youth survey (2016) which is a national representative survey of two thousand youths. The survey in an exhaustive survey comprising all the administered regions of Lebanon. The survey follows multi stage probability procedure in order to make sure a random representative of the population. In the process to calculate the joint probability of being employed and the possibility of having skill mismatch, a model with two binary dependent variables was implemented. In order to achieve the objective of knowing the determinants responsible for employability and skill mismatch, a limited dependent variable model was employed. The researcher concluded the fact that education system played an essential role in creating the skill mismatch in Lebanese youth.

31. Fatima Suleman et al (2018) overlooked the factors that affect the opinion of the employers regarding graduate's skill. The main purpose of this paper is to

scrutinize the relationship between the skills of graduates and employers strategies for solution. This paper demonstrated that employers demand different skills: some of the employers need active participation in formation of skill while some need ready-to-work aspirants. The findings of this paper will be beneficial for all stakeholders of HEIs by identifying the problems of skill and the employer solutions for the development. The methodology for searching the problem will be in-depth interviews for the human resource managers to know different problems of skill related to training and recruitment policies of graduates, as well as the relationship between industry-university in Portugal to decrease the gap and shortage.

32. Phan VO Minh Thang Et Al (2016), identified the factors responsible for employability in information sector in Vietnam and the impact those factors have on the perception of graduates. The research uses both qualitative and quantitative methods. The researcher identified key determinants of employability by going through extensive literature and talking to educators, employers and recent graduates. With the help of qualitative data, the researcher was able to create a conceptual model based on employment, employability, extrinsic factors and intrinsic factors. A study was then conducted to form the quantitative premise for the relationship between these factors.15 hypothesis were propounded in order to explore the relationship between different factors. A seven-point Likert scale was used to register the responses. Primary data was collected from IT students all over Vietnam. Multi stage sampling method was used. Primarily closeted sampling was used by taking geographical regions as base which was the followed by self-administered online survey. All data items were analyzed by using exploratory factor analysis. By making use of ProMax

rotation and principle axis factoring extraction method, ten factors were found that were responsible 64% of variation in the data set. Confirmatory factor analysis was conducted to understand the nature and relationship between constructs. The researcher was able to find that English skills and soft skills had a major impact on the employability of IT graduates. The impact of curriculum and placement support provided by the institutes was also highly significant. A multi group moderation was applied on the hypothesis in order to analyze the effect moderators such as gender, academic year etc. The researcher was able to conclude that English skills, soft skills and adaptability skills combined with quality of IT program had strong influence on the employability. Job search duration was strongly dependent upon international certified competencies and work experience of the individual.

33. Rakesh Belwal et al (2016), the researcher analyzed the causes of unemployment in the graduates of Oman which have plagued the country due to its over reliance on being an oil and petroleum centric economy. The main purpose of the paper was to evaluate the attributes and skills that are essential for employability in graduates. A combination of survey and focus approach were used as primary methods of data collection. The study uses inferential analysis. A questionnaire was used to find out most common graduate employability attribute in accordance with the research objectives and reflected these insights with 15 items of interest as hypothesis. 5-point Likert scale was used with closed ended questions in different forms. The researcher identified that knowledge and experience, English language proficiency and a good personality were major attributes that drove the needle of employability.

REPORTS

34. As per India skills report 2018 conducted two cohesive activities- Wheebox employability skill test (WEST) and India hiring intent survey. The survey was conducted in 29 states, 7 union territories, 5200 institutions holding 5, 10,000 students. The main aim of this survey was to assess the employability skills of the students using structured online assessment tool. The result of the survey helps in analysis of various parameters such as expected salary, interested in apprenticeship and training programs, employability with respect to state, city (which includes up to 10 cities), and gender. India Hiring Intent Survey was carried out by People Strong and reached out to more than 1000+ organizations/corporate from 15 different sectors. First section of India Skills Report covers WEST, which brings skill supply side or availability perspective here which is assessed using the student responses and second section of the report covers India Hiring Intent Survey, which brings demand perspective that is assessed using industry responses. Later section of the report covers matchmaking of Supply side and demand side to assess the skill gaps and way forward to bridge the gap. Analyzed data gives you insights around hiring trends for current year as well as next year, preferred sources of hiring, experience level wise hiring requirements, educational domain specific hiring requirements, apprenticeship awareness among organizations and opportunities to students for same. Along with these factors, this year we looked at the future of skills arena as well and asked organizations about specific areas they consider important for future and impact of automation on their specific sectors. One more important parameter to assess employer's perspective on employee's skill match to the job.

35. As per the report of International labor organization (ILO) in 2018published on measurement of qualifications and skills mismatches of persons in employment suggested that review of various frameworks reveals that the concept of skills encompasses three types of skills need to be incorporated in each individual; (a) Job-specific/technical skills, including specialist knowledge needed to perform job duties, knowledge of particular products or services produced, ability to operate specialized technical tools and machinery, and knowledge of materials worked on or with;10 (b) Basic skills, such as literacy, numeracy, and information and communications technology (ICT) skills; (c) Portable skills, including but not limited to problem-solving and other cognitive skills, physical skills, language skills, socio-emotional and personal behavioral skills. For effective skills policy intervention, statistics on qualification and skill mismatches should be collected at regular intervals, wherever possible on an annual basis. Relevant information and data analysis should be distributed widely, including to jobseekers, employers' and workers' organizations, public and private trainers, and career counselors and employment service providers in both the formal and informal economies.

36. A report on the Global skills Gap in 21st century by QS and institute of students employers in year 2018 analyzed the expectations employers have and its relationship with the skills graduates possess in today's dynamic labor market. The researchers also tried to find out how this skill gap can be minimized. Report used importance and satisfaction metrics in order to find the skill sets that create biggest gaps. The report was able to find out that skill gap at graduate level is a global phenomenon and employers as well as graduates can take certain necessary actions to minimize this skill gap. Flexibility and

adaptability, analytical skills, leadership, creativity and organizational skills represent the skill sets that create the biggest gap.After analyzing the Canonical model, Ricardian model was considered by the author. This model helps to deal with one of the drawbacks of canonical model to state the relevant difference between tasks and skill. The Ricardian model helps to understand the role and relationship of different type of worker. The author argued that in order to build up a better understanding of the impact of technology it is essential to develop the canonical model. The author also explained how the model can be comprehensive to include choices for workers to assign their labor hours between different types of activities and how changes in technology can be endogenous in the framework. The data collection is categorized into: may/outgoing rotation groups, March current population survey, census/American community survey, dictionary of occupational titles. O*NET scale are created using the O*NET-SOC occupational classification scheme, which we collapse into SOC occupations.

37. The report of University of Glasgow published by SCRE (research education center) in 2011 on employer's perceptions of the employability skills of new graduates suggested that employers want to have the technical as well as discipline competencies with the degree but also include: communication, leadership, team work, problem solving, critical thinking and other managerial skills. Though there are many literatures on employability of graduates, still there are issues and barriers between employers and the HEI policy, particularly in terms of expectations, mindsets etc. some recommendations are also given: embedding support for employability across the institution, importance of placements and recognizing experiential learning, reflecting wider economic

needs in HEI courses, meaningful employer participation in HEI committee.This helps the students to find their own way into employability, giving them a range of thought-provoking questions to consider, a range of resources to utilize to their benefit, and an opportunity to experience reflective writing and the approaches demonstrated in a supported environment. By exploring dream jobs and passions, students are given the chance to explore and consider what they really want to do in the future, and as such incorporating elements of commercial awareness are a must. The embedded nature of employability with this approach allows students to see it as part of their learning experience, rather than something bolted on in an ad-hoc fashion and delivered by someone who is a relative stranger to them. We believe employability is an important aspect of the student experience which can be quickly overlooked by students when it is perceived by them as an added afterthought, potentially packaged as a sales pitch for other university departments and provisions. Therefore, by having an embedded employability element student see it as something of value and relevant to their learning experience. Incorporating a reflective element to Student Engagement and Experience the assessment around skills development also allows students to gain experience of writing in such a way for when they require it with job applications, CV writing or other assignments and can provide a base from which to build further employability aspects into the delivery of a course. By exploring students' perceptions of both their own skills needs, and what they believe employers require, it is possible to use the information gathered with the delivery of the employability aspects of the module. Furthermore, it provides a fascinating insight into which areas students see as potentially the most important. The results gathered at the end of the

module show that students see that they have developed over the course of their research projects, yet also understand the areas which they still need to develop.

38. Henrik Malm Lindberg (2015) In this paper the educational system in Sweden will be analyzed in three dimensions in terms of quality, efficiency and relevance. These are seen as essential in order to deliver both competence to businesses and give young people opportunities at the labor market.These three dimensions – quality, efficiency and relevance described how sound the education system is up to the charge of facilitating the entry into the labor market and deliver trained competence and skills.

39. Hugo Figueiredo et al (2015) investigated that whether the labor market is being restructured due to education on gender differences in the countries of southern Europe which includes; Spain, Italy, and Portugal. To test the biasness of the selection criteria standard decomposition techniques are used. Technique such as standard GPG decomposition is used with new explanatory variables that provide more detail concerning younger workers' initial alteration into employment. The results confirmed that as more and more graduates move away from traditional graduate occupations—those that have always required a degree—these restructuring processes are not neutral from a gender point of view.Young women are more likely to become over-educated (especially in Spain and Portugal) and the process of transition into employment led to increase gender segregation in graduate labor markets (most notably in Spain and Italy), with one who occupied new types of graduate jobs mainly moving to already feminized jobs.

2.4 REVIEW OF LITERATURE ON TRAINING AND DEVELOPMENT

40. D. Prasanna (2017), worked on the effectiveness of training programs in engineering colleges of Coimbatore on the basis of opinion of the academicians, Training Aids, Training Facilities, Training competencies, impact of training. With the help of random sampling a survey was conducted in the engineering institutes and analyzed with different tools suchas multiple regression, Anova, factor analysis etc. The researcher concluded that the findings of the study helps to know about various training programs, its effectiveness and what should be done to improve the quality and reliability. The research model was validated and the purification process of the scale was developed and corrected with the reliable measures so that academic researchers in developing countries like India could gain further by using the model developed in this study. The aim of the study is to identify the effectiveness of training programs among the academicians in the engineering colleges.Practical and hands on training has be given more importance in the organization to improve the competency of the academicians.

41. Siti aminahOsman et al (2016), discussed the effectiveness of the industrial training from the perspective of students who have undergone 12 weeks of industrial training.The questionnaire consists of three parameters, namely students' knowledge, skills, and attitude towards industrial training. These parameters were identified as three domains of educational activities based on Bloom's Taxonomy.Win step was used to evaluate the validity and reliability of the questions, while Microsoft Excel was used to assess the

effectiveness of the industrial training from students' perspective, namely whether their perception has improved, remain unchanged, or decreased. The Rasch Model analysis showed that the questionnaire is reliable and valid. The industrial training program is clearly effective and beneficial to students as it provides professional skills not taught at the university. The knowledge and experience acquired by the students during industrial training could serve as guidance when planning for a better career in the future

42. Sumathi Renganathan et al (2011), the researcher discussed the aspect of learning through industrial internship programs and their effective inculcation in academic curriculum. The main objective of the paper is to assess the effective application of the industrial programs that are being offered by these institutes. The data was collected through questionnaire. The questionnaire included statements that were used to assess the perception of students with regard to the effectiveness of these industrial programs that are being offered by institutes. A five-point Likert scale was used to measure the responses. The researcher was able to find that majority of students described their experience of such internship programs as highly effective and helpful in learning the concepts practically and gaining effective on the job experience. Students were able to acquire work culture of the company and were able to work effectively in teams. The researcher was able to conclude through this paper that these industrial internship programs play a vital role in bridging the role between the academic world and the professional world by providing practical exposure to students.

These industrial internship programs also help the students in getting pre placement offers that help in increasing the employability of students.

43. Kamarulzaman Mat et al (2010) worked on the effectiveness of engineering students in UKM. The criterion is based on the 5-score Likert scale. There are three parameters used to study the self-changes i.e. the 'knowledge', 'skills' and 'attitude'. The researcher further concluded that industrial training provides various benefits for students, especially in terms of knowledge, skills and attitudes. In addition, they were also confident about the industrial Training benefits to themselves. However, there are few areas need to be improved, particularly in the placement of students using the SMPLAI system so that all related management can run smoothly. Five months period for industrial training also felt very appropriate to the student. There was an increase in the knowledge, skills and attitudes aspect of the students themselves. They were able to use their learned knowledge in the actual work situation. Some weaknesses, particularly in terms of communication skills have been improved for which students will be more confident to communicate and thus adapt to their working environment.

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CHAPTER 3

RESEARCH METHODOLOGY

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3.1 INTRODUCTION

Research means technical and organized search for relevant information on a particular topic. It is defined as an academic activity that involves identifying the research problem, formulating a hypothesis, collecting and analyzing data and reaching specific conclusions in the form of solutions or general theories. The primary objective of research is to find solutions for problems in a methodical and systematic way. A research depends on the field in which the research work is performed. Various types of researches can be done for different fields, like fundamental research for identifying the important principles of the research field and applied research for solving an immediate problem. However, all these researches primarily follow two approaches, quantitative and qualitative. The quantitative approach focuses on the quantity of the data obtained from the research, while the qualitative approach is concerned with the quality of the obtained data. Various authors and management gurus have defined research in different ways. Usually are search is said to begin with a question or a problem. The purpose of research is to find solutions through the application of systematic and scientific methods. Thus, research is a systematic approach for purposeful investigation.

Some of the definitions of research are:

According to **Redman and Mory,** research is a systematized effort to gain new knowledge.

According to **Clifford Woody,** research comprises defining and redefining problems, formulating hypotheses or suggesting solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they agree with the formulated hypothesis or not.

D. Slesinger and M. Stephenson in the Encyclopedia of Social Sciences define research as: 'the manipulation of things, concepts or symbols for the purpose of generalizing to extend, corrector verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art.'

According to the Merriam- (Webster Dictionary). A studious inquiry or examination, especially; investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or law in the light of new facts or practical application of such new or revised theories or law.

According to **Waltz and Bansell (1981).** Research is a systematic, formal, rigorous and precise process employed to gain solutions to problems or to discover and interpret new facts and relationships.

Every research has its own understanding and development of the particular topic. Therefore, research is something which needs to be searched again and again so that one should have different aspects of particular topic. Research is something which helps to formulate the future as well as helps to understand the current scenario.

3.1.1 Types of Research

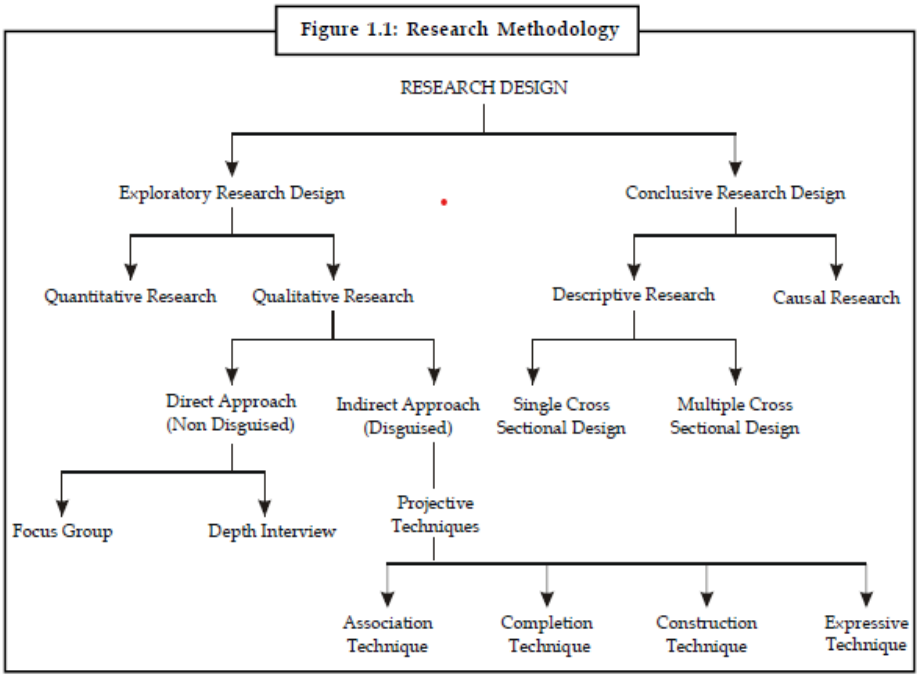

Fig: 3.1.1 Types of research

- **Exploratory Research-** This type of research is carried out at the very beginning when the problem is not clear or is vague. In exploratory research, all possible reasons which are very obvious are eliminated, thereby directing the research to proceed further with limited options.

- **Descriptive Research-** The main purpose of descriptive research is to describe the state of view as it exists at present. Simply stated, it is a fact finding investigation. In descriptive research, definite conclusions can be arrived at, but it does not establish a cause and effect relationship.

- **Applied Research-** Applied research aims at finding a solution for an immediate problem faced by any business organization. This research deals with real life situations.

- **Pure/Fundamental Research or Basic Research-** Gathering knowledge for knowledge's sake is known as basic research. It is not directly involved with practical problems. It does not have any commercial potential. There is no intention to apply this research in practice.

- **Conceptual Research-** This is generally used by philosophers. In this type of research, the researcher should collect the data to prove or disapprove his hypothesis. The various ideologies or 'isms' are examples of conceptual research.

- **Historical Research-** The name itself indicates the meaning of the research. Historical study is a study of past records and data in order to understand the future trends and development of the organization or market. There is no direct observation. The research has to depend on the conclusions or inferences drawn in the past.

From the above classification of research methods, we had conducted an **Empirical Research** because this type of research is data based that comes up with conclusions and do not depend on any system or theory. It depends on the experience and observation of the researcher.

3.2 NEED OF THE STUDY

Fundamentally, in today's Indian context the contribution of engineers to the national economy is very significant and substantial. As a nation, we are facing toughest challenges in every field globally and the competition is very severe. Obviously, the competencies required would be of very high order for basic survival and of course, success in all walks be it Manufacturing, Design, Research & Development, Instrumentation, Electronics, Communication, Computers, Information Science,

Services, Marketing and many more. With this as the situation, opportunities for growth are plenty for those with the right competencies while survival itself would be very hard for those lacking competencies. As manufacturing and service industry are very predominant contributors to the GDP, the human resource requirement for these sectors will also grow rapidly, but the point of caution is that quantitative growth though very essential qualitative growth is imminent and it is just the simple need of the hour. Especially when sourcing and supply of both raw materials and finished goods & services are very globally open, both opportunities and challenges are of a high toll. In order to face the challenges and exploit the opportunities the engaging human resource will have to be knowledge based with right competencies in respective fields and engineering is not an exception. The scenario being as described above, unfortunately, as cited by many leading industrialists and NASCOM the percentage of employable graduate engineers just hovers around 15 to 25%. With regard to engineering and technology institutions, the numbers have grown like mushrooms but in most of the cases, the quality of engineers / output is appalling.

3.3 STATEMENT OF THE PROBLEM

The role of Technical education in the progress and growth of a nation is well acknowledged all over the world. In case of India the number of people entering the technical educationsystem has never been a problem. Conversely the relevant problem has been the relative skills and employability of the people. The widening of skill gap and increase in the unemployability of engineering graduates has become a tremendous pain point for government as well as other stake holders. There is an urgent need for improving the technical education system and reducing the skill gap in order to convert youth into educated employable citizens for both their own

development as well as the development of the Nation.The root cause of the problem invariably happens to be the mismatch between the demand and supply of skills. The skills demanded by the industries are often not found in the engineering graduates that are fresh off the boat. The skills that they possess are often termed as obsolete or are presently not needed by the employers. This situation creates a state of disequilibrium and serves no purpose at all.Another point of relevance which helps to reduce this skill mismatch is the appropriateness of training provided to engineering graduates.Often it has been seen that training serves as the two-fold objective of both helping students master new skills and reducing the skill gap they possess. Thus, there is a need to address certain questions-

- What are skills demanded by employers?
- What are skills supplied by the academic institutes?
- What are the skills possessed by the engineering graduates?
- What are the factors responsible for mismatch?
- If the skills demanded and supplied are not in perfect harmony with each other, Then what are the implications and consequences of such a mismatch?
- What are the different types of training provided to the engineering students?
- What is the effectiveness and appropriateness of the training provided to the engineering graduates?

In order to find the answers to the very important questions listed above the study has been undertaken with a systematic focus on reducing the widened skill gap in engineering graduates. It seems probable for an economy to transform and develop when the workforce it possesses is highly skilled. The study ventures into finding ways through which the skill gap could be diminished with some policy interventions

by the government, support of academic organisations and key guidance of industries in developing policies that could benefit all the stakeholders.

3.4 SAMPLE DESIGN

3.4.1 Sampling frame

The study was conducted on the Engineering Students, Academicians of Engineering Institutes, and HR managers of IT, Automotive & Pharmacy Industries from Madhya Pradesh.

3.4.2 Sampling Size

275- Academicians

300- Engineering Students

100- Industrialists (HR Professionals)

3.4.3 Sampling Technique

In research, a sample is a group of people, objects, or items that have been picked from the entire population. A good sampling technique helps to generalize the findings. Broadly sampling is of various types: Probability & Non Probability Sampling.

In our study we had applied two types of sampling techniques: first is **Cluster Sampling** and another is **Simple Random Sampling**. According to Kothari (2019) Cluster sampling involves grouping the population and then selecting the groups or the clusters rather than individual elements for inclusion in the sample and in Simple Random Sampling, each and every item in the population has an equal chance of inclusion in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected. In **Cluster Sampling** we had

divided the population of Madhya Pradesh into smaller groups known as clusters and then selected randomly among these clusters. We had applied multi stage cluster sampling by randomly selecting the individual units to use as our sample rather than collecting data from every single unit in the selected clusters. **Simple random sampling** applies basically to select randomly the subset of the population to be used as the respondents for the survey purpose.

3.5 HYPOTHESIS TESTING

Hypothesis is a presumptive statement, which has the capability of being justified, is to be tested on the basis of its implications with empirical evidence and previous knowledge. According to Van Dalen, "A hypothesis serves as a powerful beacon those lights the way for research worker".

Testing of simple hypothesis is done either by observations or experiments. When the hypothesis is verified by an experiment in a laboratory it is called direct verification. Indirect verification is done on complex hypothesis wherein some possible outcomes are deduced and then checked directly.

3.5.1 Process of hypothesis testing

Testing of a hypothesis is done by using statistical methods. Testing is used to accept or reject an assumption about a random variable.

The assumption is the **Null Hypothesis (H0)**, and it is tested against some **Alternative Hypothesis (H1).** Statistical tests of the hypothesis are applied to the sample data such as t-test and z-test to convert the attributes into statistical form and then finally draw the inference of accepting or rejecting the null hypothesis.

3.5.2 Hypotheses of the Study

H01:- Requisite skill demanded by industry is not having positive and significant impact on employability among engineering aspirants.

H02:- Available employability skills in engineering aspirants are not having positive and significant impact on employment.

H03:- Training programs provided by the institutes & universities are not helpful in getting good placement after completing the engineering course.

3.6 DATA COLLECTION METHOD

This is, indeed, the most meticulous part of research process. This involves collecting the information from the respondents or the selected sample. Data collection can be done in two ways**: Primary and Secondary.**

In primary data collection, information is collected directly from the respondents. It is also the first-hand knowledge about the selected population. It can be done through different methods like Self-administered questionnaires, in-depth interviews, observation, schedule etc.

In secondary data collection, we make explicit use of second-hand information, which means an information which is already been given by some other person. Methods like biographies, research papers, journals, thesis, archives etc are considered as a part of secondary data collection.

In our study we had used both the methods of data collection. Firstly, we had collected the data from different sources like internet, journals, magazines etc to make a base for our study and mould the information as per our study. After this step we

started preparing the questionnaire and data was collected by administering the questionnaire with the participating respondents. Due to the pandemic situation of Covid-19, we switch our data collection onto google forms as personal interactions had been hindered due to lockdown.

3.7 QUESTIONNAIRE DESIGN

Questionnaire is the research instrument consists of a series of questions to the respondents for the purpose of gathering information and is used during structured surveys or interviews. The questions can be open ended or closed ended or combined. Open ended questionnaire offer flexibility to respondents to answer the questions, whereas close ended questionnaire picks an answer from the given questions. In our study we had used a combined form of questionnaire and ask the respondents for providing their views.

Three type of self -administered questionnaire is used in this study: Questionnaire for Academicians, Questionnaire for Industrialists (HR professionals), Questionnaire for Engineering Students. The **Reliability** had been checked as per Cronbach Alpha instrument. Reliability helps the researcher to confirm the consistency of the questionnaire. It helps to check that the items included will provide the same result if tested again and again irrespective of any situation.

3.8 PILOT RESEARCH

The pilot research is important because it provides confirmation that the procedures used are suitable helps to refine the survey questions and makes sure that the survey used in the main research is appropriate (Zikmund et al., 2010). Hence we used a pilot research before conducting the main research.

Within this survey we had undergone the personal interviews and collected the opinions of engineering graduates, academicians and industrialists, Totally 40 are invited to answer the questionnaire and give out their feedbacks.

The pilot test was carried out to test the clarity and meaningfulness of the questions in order to detect weakness in design and instrumentation as well as to provide proxy data for selection of a probability sample. After the test, there are evidences that questionnaires have a good layout, easy to understand, logical arrangement of items and the requirement of the reliability analysis was met.

3.9 STATISTICAL TOOLS

After the data is collected with the help of self-administered questionnaire, it will be analyzed by applying the proper statistical tools. The result of the analyzed data will be interpreted in the light of hypothesis and its deduced consequences. Data was analyzed by using SPSS Version 23.0 for Windows software the normality and the dispersion of the data are checked; the reliability and validity of the measures are tested; and the hypothesis developed for this research are also tested. Reliability of data was checked through Cronbach's Alpha. Other techniques which was used in analyzing the data for this research, such as descriptive statistics, factor analysis and multiple regression analysis.

Descriptive statistics

The descriptive statistics provides frequencies and measures of central tendency of this research analysis. So, frequencies of this analysis can be refer to histograms or bar charts of various subcategories, such as gender, level of occupations and level of educations.

Factor analysis: It is a statistical tool which helps to reduce the large number of attributes into fewer variables. It is a part of general linear model (GLM) which assumes an assumption that there is a linear relationship among the variables. This tool helps the researcher to extract maximum common variance from all the variables and puts them into a common score. Factor analysis can be of different types: common factor analysis, image factoring, principal component analysis, maximum likelihood method, exploratory factor analysis, confirmatory factor analysis, structural equation modelling.

In our study we had used **exploratory factor** analysis as it assumes that any variable may be associated with any factor. Exploratory factor analysis helps to measure the primary factors that affect the variables in the arranged data without setting any predefine structure to the consequence.

Regression:

It is also a statistical tool that helps the researcher to analyse and understand the relationship between two or more variables of interest. It helps to understand the importance of different factors which need to be taken in the study and other that can be ignored. Though we need to find the relationship between independent and dependent variables but we had taken many variables in our study, so we had applied **multiple regression** instead of simple/linear regression.

3.10 STATISTICAL PACKAGE FOR SOCIAL SCIENCES (SPSS)

SPSS is an integrated set of modules used for manipulating, analyzing and presenting the data. The SPSS package consists of a statistical number of written flexible computer programs which can vary on the maximum or minimum sample size used in

research. According to Coakes (2005) SPSS has almost all statistical features available and is widely used by researchers to perform quantitative analysis.

3.11 CONCLUSION

This chapter discussed the research methodology applied to the present study. Various steps in the research process were discussed. This also included a comprehensive discussion of the scope of the survey, the sampling method and the organization of the survey. Furthermore, the data collection techniques, rationale for using the selected methods of data collection were also highlighted. In addition, data processing and the statistical packages used to analyze the data were also highlighted.

3.12 REFERENCES

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CHAPTER 4

DATA ANALYSIS

CHAPTER 4

DATA ANALYSIS

4.1 INTRODUCTION

This chapter provides the detail about data analysis after the data collection aimed to Assess obtain the various factors responsible for mismatch between demand and supply of requisite skills in engineering aspirants with special reference to Madhya Pradesh. This chapter will give a deep insight to identify the available employability skills in engineering aspirants.

In this chapter, researcher will put the Reponses in the tabular as well as graphical form. The graphical analysis will help the researcher to understand the profile of the respondents and their responses to various research questions, drafted after considering the objectives of the research.

4.2 DATA ANALYSIS OF ENGINEERING STUDENTS

4.2.1 Distribution according to Gender

Table. No. 4.2.1 Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	272	90.7	90.7	90.7
	female	28	9.3	9.3	100.0
	Total	300	100.0	100.0	

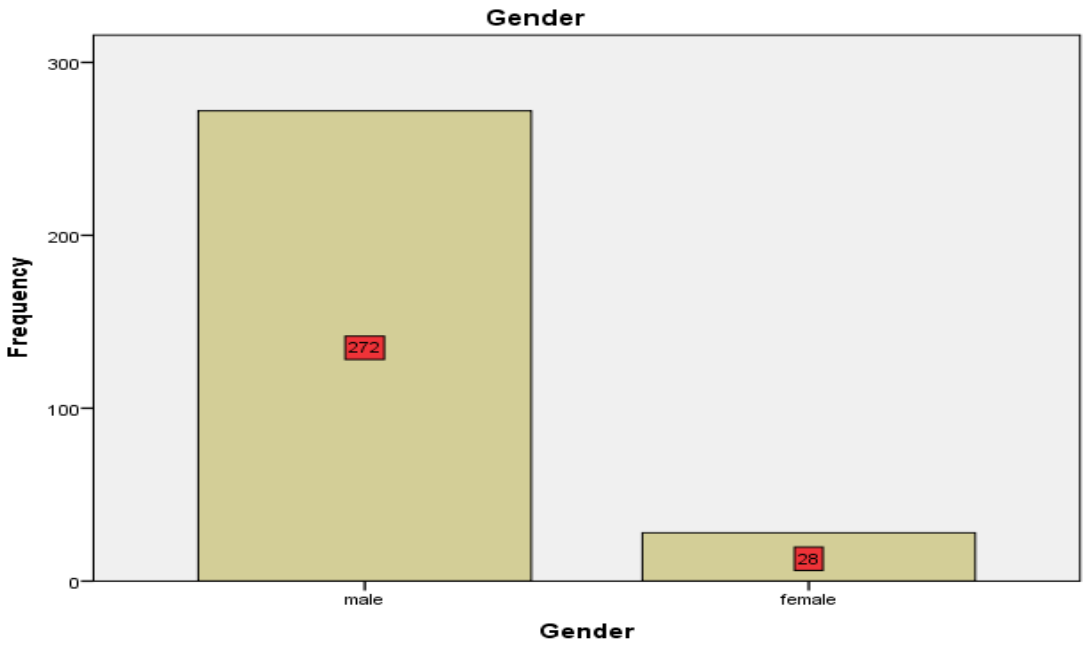


Figure 4.2.1 Distribution of Responses according to gender

The above table of distribution showed that out of the total 300 respondents. The majority of the respondent 90.7 per cent are male and remaining 9.3 percent are female.

4.2.2 Students belong from which type of university/affiliated college

Table. No. 4.2.2 Students belong from which type of university/affiliated college

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	central university	149	49.7	49.7	49.7
	Government	5	1.7	1.7	51.3
	Semi government	11	3.7	3.7	55.0
	Private university	129	43.0	43.0	98.0
	Deemed University	6	2.0	2.0	100.0
	Total	300	100.0	100.0	

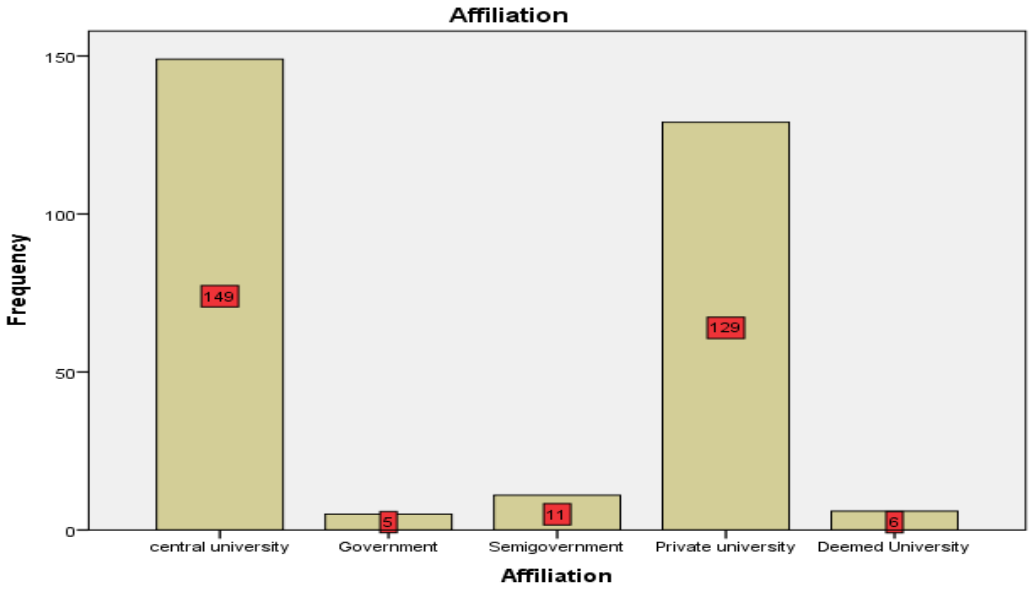


Figure 4.2.2 Distribution of responses according to type of university/affiliated college they belong

The above table of distribution showed that out of the total 300 respondents 49.7 per cent students college is affiliated to the central university, 43 per cent Students college is affiliated to the private university, 3.7 per cent students college is affiliated to the semi-government university, 2 per cent students college is affiliated to the deemed university and remaining 1.7 per cent students college is affiliated to the government university.

4.2.3 Distribution of responses according to their discipline

Table. No. 4.2.3 Discipline

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Computer Science/ IT	90	30.0	30.0	30.0
	Mechanical	190	63.3	63.3	93.3
	Civil	6	2.0	2.0	95.3
	Electrical/ Electronics/ communication	12	4.0	4.0	99.3
	chemical	2	.7	.7	100.0
	Total	300	100.0	100.0	

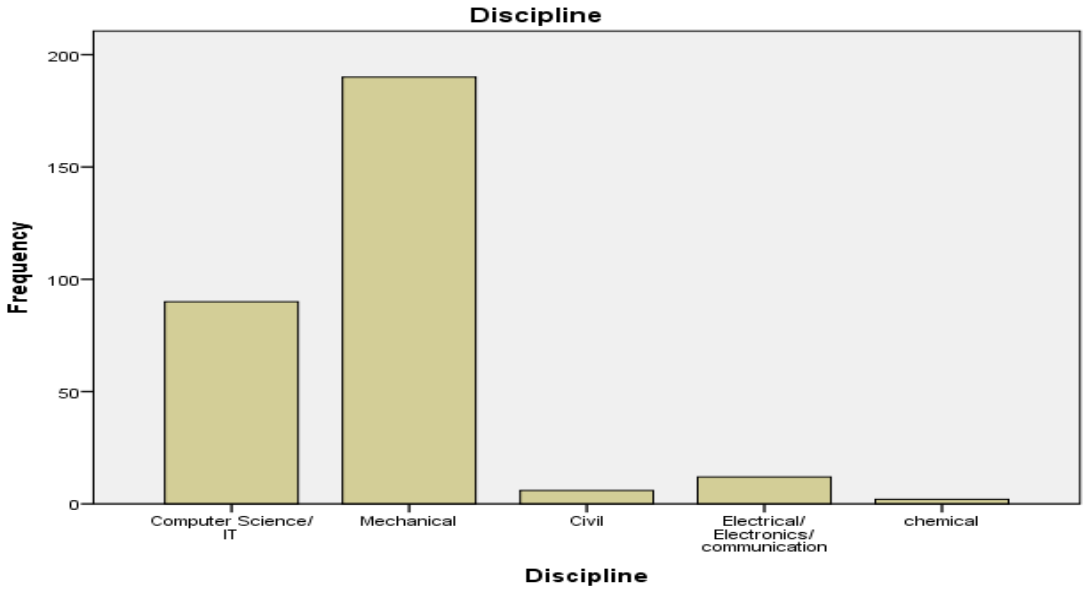


Figure 4.2.3 Distribution of responses according to their discipline

The above table of distribution showed that out of total 300 respondents 63.3 per cent was from mechanical branch, 30 per cent of respondents was from information technology or computer science, 4 per cent was from communication / electronics / electrical, 2 per cent was from civil branches, and remaining 0.7 per cent was from chemical branches. The majority of respondents are from mechanical branch in which the placement needs the core company and practical knowledge as well.

4.2.4 Type of training programs provided by the institute

Table. No. 4.2.4 Type of Training program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	summer	106	35.3	35.3	35.3
	in-house	57	19.0	19.0	54.3
	placement	105	35.0	35.0	89.3
	managerial	32	10.7	10.7	100.0
	Total	300	100.0	100.0	

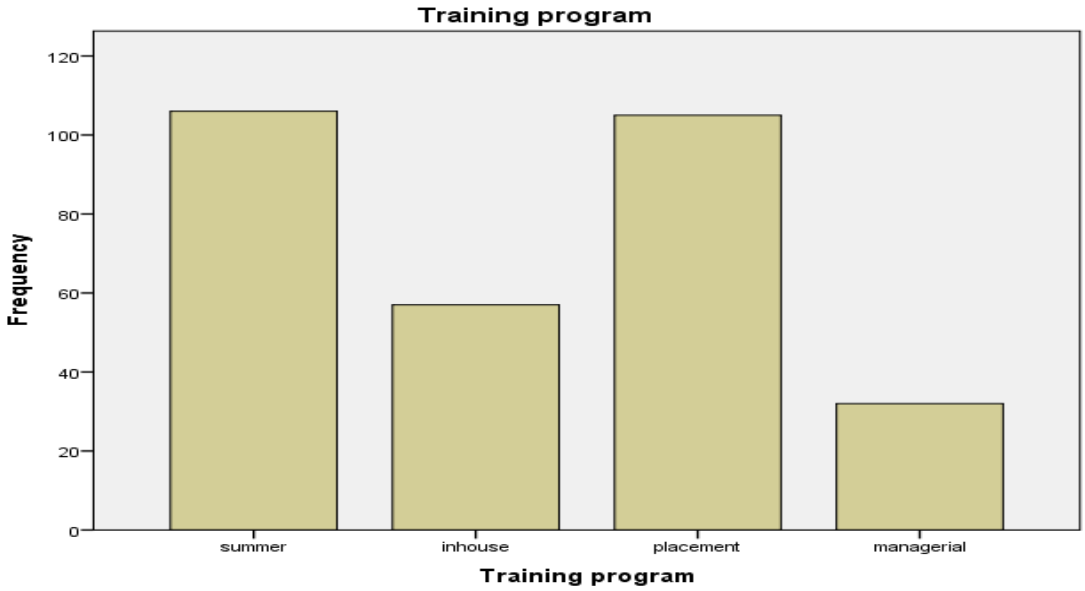


Figure 4.2.4 Type of training programs provided by the institute

The above table of distribution shows that the type of trainings provided to students by the institute. Result shows that out of total 300 respondents 35.3 per cent of students says that institute provides Summer internship, live projects and industry sponsored training program, According to 35 per cent of students institute provides Placement support and communication skills training, 19 per cent of students says that institute provides In-house training program/ Classroom training and according to 10.7 per cent of students institute provides Managerial and entrepreneurial development training. The majority of institute provides summer internship, live projects and industry sponsored training program because these type of training provides practical knowledge and develop analytical skills among students.

4.2.5 Number of summer internship, live projects and industry sponsored training program

Table. No. 4.2.5 Total no of internship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	6	2.0	2.0	2.0
	one	92	30.7	30.7	32.7
	two	81	27.0	27.0	59.7
	three	30	10.0	10.0	69.7
	four	57	19.0	19.0	88.7
	five	6	2.0	2.0	90.7
	six	28	9.3	9.3	100.0
	Total	300	100.0	100.0	

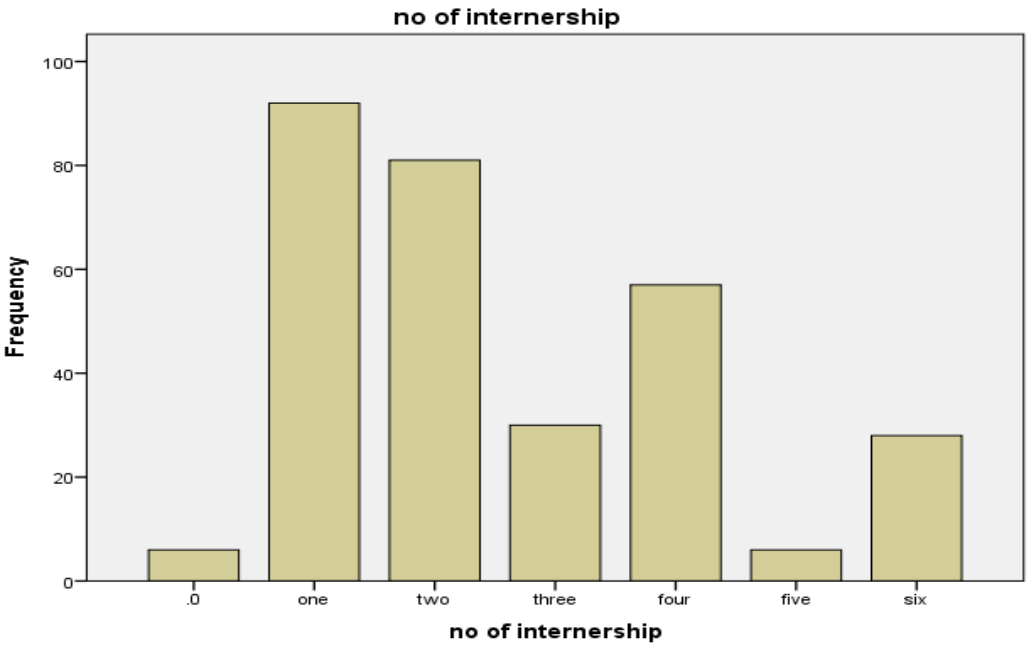


Figure 4.2.5 Total no of internship

The above table of distribution discuss about the number of summer internship trainings attended by the students. Result shows that out of total 300 respondent's majority of 30.7 per cent of students attended one training program. 27 per cent of students attended two days training program, 19 per cent of students attended four days, 10 per cent of students attended three days training program and 9.3 per cent of students attended six days training program.

4.2.6 Duration of the training program

Table. No. 4.2.6 Duration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	2	.7	.7	.7
	12 weeks	124	41.3	41.3	42.0
	120 days	83	27.7	27.7	69.7
	six months	62	20.7	20.7	90.3
	1 year	25	8.3	8.3	98.7
	1-1.5 year	4	1.3	1.3	100.0
	Total	300	100.0	100.0	

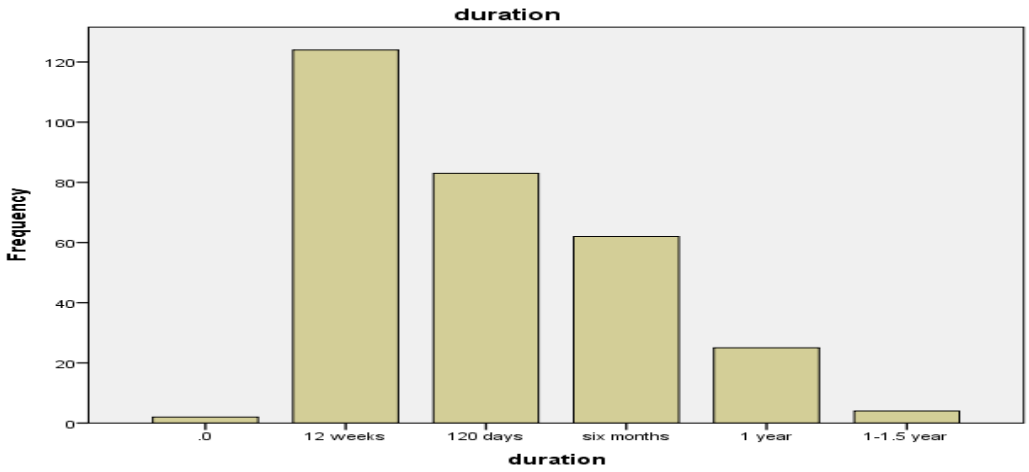


Figure 4.2.6 Duration of the training program

The above table of distribution talk about the duration of trainings program attended by the students. Result shows that out of total 300 respondent's majority of 41.3 per cent of students attended 12 weeks training program. 27.7 per cent of students attended 120 days training program, 20.7 per cent of students attended six months training program, 8.3 per cent of students attended one year training program and 1.3 per cent of students attended 1-1.5 year training program.

4.2.7 Satisfaction with duration of training program

Table. No. 4.2.7 Satisfaction with duration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Satisfied	60	20.0	20.0	20.0
	Satisfied	75	25.0	25.0	45.0
	Neutral	15	5.0	5.0	50.0
	Dissatisfied	90	30.0	30.0	80.7
	Highly Dissatisfied	/60	20.0	20.0	100.0
	Total	300	100.0	100.0	

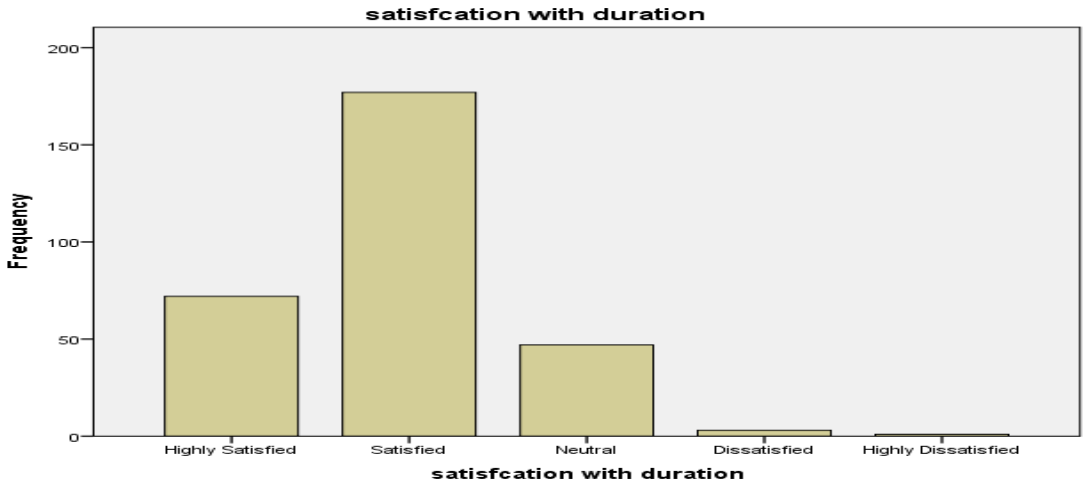


Figure 4.2.7 Satisfaction with duration

Majority of the students are dissatisfied with duration of summer internship, live projects and industry sponsored training program provided by the institute. In the above table, out of the total 300 respondents, majority of 150 (50%) are dissatisfied with duration of training program. 20 percent of the respondents are highly satisfied with duration of training program. 5.0 percent of the respondents are neutral for duration of training program. 25.0 percent of the respondents satisfied with duration of training program. Institution should increase the duration of training program.

4.2.8 Rate the Statement regarding summer internship, live projects and industry sponsored training programs on Likerts five scale

Table No. 4.2.8 Rate the statements regarding summer internship, live projects and industry sponsored training programs on Likerts five scale

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Able to achieve the objective it was meant for	25.7	57.7	16.0	.3	.3
Enhance employability skills	25.7	47.3	25.0	1.7	.3
Well executed and well planned	23.7	14.7	16.0	44.3	.3
Able to provide knowledge and understanding of subject	28.7	50.7	18.3	1.7	.7
Able to provide practical experience of theoretical concepts	28.3	48.7	21.3	1.0	.7
Effective and informative	23.7	51.3	22.7	2.0	.3

The above table shows the objective of summer internship, live projects and industry sponsored training programs in view of students. Result shows that students agreed that summer internship, live projects and industry sponsored training programs was able to achieve the objective it was meant for. According to students these training program enhance employability skills. 44.3 per cent of the

respondents disagree that summer internship, live projects and industry sponsored training programs is well executed and well planned. According to students these training program able to provide knowledge and understanding of subject, students agreed these training program able to provide practical experience of theoretical concepts and according to students summer internship, live projects and industry sponsored training programs was effective and informative. So the result shows that summer internship, live projects and industry sponsored training programs enhance skills of students but these training programs should be well executed and well planned.

4.2.9 To what extent you have acquired the following attributes during the summer internship program, live projects and industry sponsored training programs.

Table No. 4.2.9 Attributes acquired during the summer internship program, live projects and industry sponsored training programs

Statements	To a Very Great Extent	To a Great extent	To a Lesser Extent	Not at all
Big Data analysis skills	23.0	44.0	32.0	1.0
Conflict resolution skills	30.7	38.0	30.3	1.0
Cyber security and Analytics skills	23.3	39.7	34.3	2.7
Data warehousing and Data mining skills	23.7	40.3	34.3	1.7
Decision making skills	27.3	43.3	29.0	.3
Knowledge about automation and artificial intelligence	30.3	42.0	26.0	1.7
Knowledge about cloud-based computing and block chain technologies	24.3	46.0	27.3	2.3
Leadership skills	29.0	42.0	28.3	.7
Management and Entrepreneurial skills	32.0	39.7	27.3	1.0
Practical Knowledge about the subject	32.3	43.0	23.7	1.0
Problem solving and critical thinking skills	26.7	45.3	27.0	1.0
Time management skills	27.0	45.0	3.3	24.7
Working under pressure	31.7	38.3	27.7	2.4

The above question is related to attributes acquired by students during summer internship training program. The table depicted that 46.0 per cent of the students acquired big data analysis skills to a great extent. 38.0 per cent of the students acquired conflict resolution skills to a great extent. 39.7 per cent of the students

acquired Cyber security and Analytics skills to a great extent. 40.03 per cent of the students acquired warehousing and Data mining skills at an great extent level. 43.3 per cent of the students acquired Decision making skills to a great extent. 42.3 per cent of the students acquired Knowledge about automation and artificial intelligence to a great extent. 46.0 per cent of the students acquired Knowledge about cloud-based computing and block chain technologies. 42.0 per cent of the students acquired leadership skills to a great extent. 39.7 per cent of the students acquired Management and Entrepreneurial skills to a great extent. 43.0 per cent of the students acquired Practical Knowledge about the subject to a great extent. 45.3 per cent of the students acquired Problem solving and critical thinking skills to a great extent. 45.0 per cent of the students acquired Time management skills Problem to a great extent. 38.3 per cent of the students acquired Working under pressure skills to a great extent. The engineering graduates are acquiring skills to a great extent during in-house training program.

4.2.10 In the present question some statements are given related to In-house training program you joined. To what extent you are agreeing with these statements. Do you think In-house training programs were?

Table No. 4.2.10 Level of agree on the statements related to in house training program

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Able to achieve the objective it was meant for	28.0	50.7	20.3	2.0	1.0
Enhance employability skills	26.0	49.0	23.0	1.7	.3
Well executed and well planed	32.3	44.3	21.3	2.0	1
Able to provide knowledge and understanding of subject	26.0	51.3	20.3	1.7	.7
Able to provide practical experience of theoretical concepts	29.3	41.3	26.7	2.0	.7
Effective and informative	28.3	45.0	24.7	1.0	1.0

Result shows that students agreed that in-house training program was able to achieve the objective it was meant for. According to students these training program enhance employability skills. 64 per cent of the respondents thinks that summer internship, live projects and industry sponsored training programs is well executed and well planned. According to students these training program able to provide knowledge and understanding of subject, students agreed these training program able to provide practical experience of theoretical concepts and according to students in-house training programs was effective and informative.

4.2.11 To what extent you have acquired the following attributes during the In-House Training program. Rate the statements on five-point Likert Scale from Full Extent to Not at all

Table No. 4.2.11 Attributes acquired during the In-House Training program.

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Big Data analysis skills	29.0	42.7		26.0	2.3
Conflict resolution skills	38.7	51.0		9.0	1.3
Cyber security and Analytics skills	40.7	42.3		14.0	3.0
Data warehousing and Data mining skills	26.3	57.3		14.0	2.3
Decision making skills	39.3	46.7		13.7	.3
Knowledge about automation and artificial intelligence	28.3	44.7		22.0	5.0
Knowledge about cloud-based computing and block chain technologies	26.7	42.3		24.0	7.0
Leadership skills	29.7	43.3		23.3	3.6
Management and Entrepreneurial skills	33.3	41.3		20.7	4.6
Practical Knowledge about the subject	31.0	42.7		21.7	4.6
Problem solving and critical thinking skills	28.3	41.7		24.7	5.4
Time management skills	29.7	42.0		24.0	4.3
Working under pressure	27.0	39.7		29.3	4.0

The above question is related to attributes acquired by students during in-house training program. The table depicted that 42.7 per cent of the students acquired big data analysis skills to a great extent. 51.0 per cent of the students acquired conflict resolution skills to a great extent. 42.3 per cent of the students acquired Cyber security and Analytics skills to a great extent. 57.03 per cent of the students acquired

warehousing and Data mining skills at an great extent level. 46.7 per cent of the students acquired Decision making skills to a great extent. 44.7 per cent of the students acquired Knowledge about automation and artificial intelligence to a great extent. 42.3 per cent of the students acquired Knowledge about cloud-based computing and block chain technologies. 43.3 per cent of the students acquired leadership skills to a great extent. 41.3 per cent of the students acquired Management and Entrepreneurial skills to a great extent. 42.7 per cent of the students acquired Practical Knowledge about the subject to a great extent. 41.7 per cent of the students acquired Problem solving and critical thinking skills to a great extent. 42.0 per cent of the students acquired Time management skills Problem to a great extent. 39.7 per cent of the students acquired Working under pressure skills to a great extent. The engineering graduates are acquiring skills to a great extent during in-house training program.

4.2.12 Satisfaction with in- house training program

Table. No. 4.2.12 Satisfaction with in- house training program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Satisfied	63	21.0	21.0	21.0
	Satisfied	180	60.0	60.0	81.0
	Neutral	55	18.3	18.3	99.3
	Dissatisfied	2	.7	.7	100.0
	Total	300	100.0	100.0	

Result shows that majority of the students are satisfied with in house training program provided by the institute. In the above table, out of the total 300 respondents, majority of 180 (60%) are satisfied with in-house training program and this can groom the

students as per industry demands. 21 percent of the respondents are highly satisfied with in-house training program. 18.3 percent of the respondents are neutral for in-house training program and .7 percent of the respondents was dissatisfied with training program.

4.2.13 In your opinion, what are the factors responsible for limiting the effectiveness of training program?

Table No. 4.2.13 Factors responsible for limiting the effectiveness of training program

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Rank
Inappropriate training Infrastructure, apparatus, tools, machinery, labs	20.0	40.0	5.0	25.0	10.0	4
Insufficient duration of training	18.0	34.0	8.0	26.0	14.0	5
Lack of well qualified training provider	26.0	44.0	6.0	15.0	9.0	2
Lack of seriousness towards training program by student	20.0	27.0	11.0	26.0	16.0	7
Lack of proper information by the industries to students	19.0	31.0	12.0	20.0	18.0	8
Lack of industry sponsored training labs and apparatus in educational institutes	30.0	45.0	6.0	11.0	8.0	1
No feedback mechanism to review effectiveness of training program	22.0	40.0	6.0	19.0	13.0	3
Lack of multidisciplinary training programs	17.0	33.0	10.0	25.0	15.0	6

The above table shows the factors responsible for limiting the effectiveness of training for students. Result shows that majority of respondents agreed that Lack of industry sponsored training labs and apparatus in educational institutes is a major factor and ranked first among the factors. Lack of well qualified training provider ranked as second factor. No feedback mechanism to review effectiveness of training program

ranked as third factor. Inappropriate training Infrastructure, apparatus, tools, machinery, labs ranked as fourth factor. Insufficient duration of training ranked as fifth factor. Lack of multidisciplinary training programs ranked as sixth factor. Lack of seriousness towards training program by student ranked as seventh factor and Lack of proper information by the industries to students ranked as eighth factors.

4.2.14 In the present question some statements are given related to Placement Support and Communication Skill Training Program. Do you think Placement Support and Communication Skill Training Program were?

Table No. 4.2.14 Rate the statements related to placement support and communication skill training program on Likerts five scale

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Able to achieve the objective it was meant for	29.0	57.0	19.7	1.0	.3
Enhance employability skills	27.7	49.0	22.0	1.0	.3
Well executed and well planed	27.7	51.1	18.3	1.7	1.3
Able to provide knowledge and understanding of subject	27.7	47.0	23.0	1.7	.7
Able to provide practical experience of theoretical concepts	28.0	46.7	23.7	1.0	.7
Effective and informative	28.7	44.3	25.0	1.0	1.0

The above table shows the objective of Placement Support and Communication Skill Training programs in view of students. Result shows that students agreed that placement support and communication skill training Program were able to achieve the objective it was meant for. According to 76.7 per cent of the students these training program enhance employability skills. 78.8 per cent of the respondents think that placement support and communication skill training programs is well executed

and well planned. According to 74.7 per cent of the students these training program able to provide knowledge and understanding of subject, students agreed these training program able to provide practical experience of theoretical concepts and according to 73 per cent of the students placement support and communication skill training programs was effective and informative.

4.2.15 To what extent you are satisfied with placement support and communication skill training program of your institute and their helpfulness in your good placement after completing the engineering course.

Table. No. 4.2.15 Satisfaction with Placement Support and Communication Skill Training Program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Satisfied	30	10.0	10.0	10.0
	Satisfied	75	25.0	25.0	35.0
	Neutral	30	10.0	10.0	45.0
	Dissatisfied	165	55.0	55.0	100.0
	Total	300	100.0	100.0	

Result shows that majority of the students are dissatisfied with placement support and communication skill training program of their institute and their helpfulness in your good placement. in the above table, out of the total 300 respondents, majority of 165 (55%) are dissatisfied with placement support and communication skill training program and this can help the students in there placements and career development. 10.0 percent of the respondents are neutral for placement support and communication skill training program and 35 percent of the respondents was

satisfied with training program. this shows that institute should focus more placement support and communication skill training program.

4.2.16 Is there any course or program in your curriculum for managerial and entrepreneurial training?

Table No. 4.2.16 Managerial and Entrepreneurial training program in course curriculum

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	144	48.0	48.0	48.0
	No	156	52.0	52.0	100.0
	Total	300	100.0	100.0	

Result shows that majority of the students agreed that there is no course in there curriculum for managerial and entrepreneurial training. In the above table, out of the total 300 respondents, majority of 156 (52%) respondents said that there is no course in there curriculum for managerial and entrepreneurial training.

4.2.17 To what extent you are agree with the following statements regarding training providers or trainers; on five-point Likert Scale from Strongly Agree to Strongly Disagree). Do you think Trainers / Training Providers?

Table No. 4.2.17 Regarding level of agree on the statements related to training providers/ trainer on Likerts five scale

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Created an atmosphere of continuous learning	31.3	49.3	18.3	.7	.3
Provided feedback at the end of training program	31.3	44.3	22.7	1.3	.3
Was able to establish and maintain good relationship with trainee	28.0	52.0	19.0	.7	.3
Was an expert of his field	31.7	46.3	19.7	1.3	1.0
Was interactive during the training program	31.0	43.0	24.7	.7	.7

The above table shows the opinion of students regarding trainers/training providers. Result shows that 80.6 % of students agreed that trainers created an atmosphere of continuous learning. 75.6 percent of the respondents agreed that trainers Provided feedback at the end of training program, 80.0 percent of the respondents agreed that training providers are able to establish and maintain good relationship with trainee, 78.0 percent of the respondents agreed that training providers was an expert of his field and 74.0 percent of the respondents agreed that training providers was interactive during the training program.

4.2.18 To what extent you felt / experienced following limitations during your training programs. Rate the statements on five-point Likert Scale from To a Very Great Extent to not at all?

Table No. 4.2.18 Experienced limitation during training programs

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Inappropriate attention towards internship training by training and placement cell	29.0	44.0	23.0	2.7	1.3
Insufficient duration of training	29.7	33.0	32.3	3.3	1.7
Lack of appropriate training Infrastructure/ apparatus/ tools/ machinery/ labs in industries	30.7	35.3	27.7	5.0	1.3
Lack of incubation centers in educational institutes	28.0	35.0	31.3	4.7	1.0
Lack of industry sponsored training labs and apparatus in educational institutes	24.3	36.7	33.3	4.3	1.3
Lack of information and awareness regarding Industry sponsored training program	25.3	36.3	32.3	5.3	.7
Lack of multidisciplinary training programs	23.0	39.0	31.3	5.3	1.3
Lack of proper information by the industries to students	27.7	32.3	32.7	5.7	1.7
Lack of training sessions by Specialized experts of the particular field	24.7	36.7	32.7	4.7	1.3
No feedback mechanism to review effectiveness of training program	28.7	31.7	33.3	5.3	1.0

The above table described about the limitations experienced by the students during their training programs. result shows that 44.0 percent of students felt inappropriate attention towards internship training by training and placement cell to a great extent. 33.0 percent of the respondents felt insufficient duration of training to a great extent, 35.3 percent of the respondents felt lack of appropriate training infrastructure/ apparatus/ tools/ machinery/ labs in industries to a great extent, 35.0

percent of the respondents felt lack of incubation centers in educational institutes to a great extent, 36.7 percent of the respondents felt lack of industry sponsored training labs and apparatus in educational institutes to a great extent, 36.3 percent of the respondents felt lack of information and awareness regarding industry sponsored training program to a great extent, 39.0 percent of the respondents felt lack of multidisciplinary training programs to a great extent, 32.3 percent of the respondents felt lack of proper information by the industries to students to a great extent, 36.7 percent of the respondents felt lack of training sessions by specialized experts of the particular field to a great extent and 31.7 percent of the respondents felt no feedback mechanism to review effectiveness of training program.

4.2.19 To what extent do you think that following steps will make engineering program more accessible?

Table No. 4.2.19 Steps to make engineering program more accessible

Statements	Highly Essential	Essential	Moderately needed	Less Essential	Not at all essential
Reducing the rate of education loans	32.0	55.3	9.7	2.0	1.0
Interest free education loans for underprivileged students	43.0	39.3	15.3	1.7	.7
Reducing the cost of engineering by setting ceiling for engineering fee	37.3	46.3	14.3	1.3	.7
Providing funds to engineering students for student exchange programmes	34.0	47.0	17.0	1.0	1.0
Students interaction with industry experts to provide insight about the engineering program	35.7	47.7	15.3	.7	.7
Setting up of counselling centers to provide snapshot of the course contents of engineering program to make students familiar with the engineering program	35.7	50.3	12.3	1.0	.7

The above table described about the steps which will make engineering program more accessible. according to 55.3 percent of students it is essential to reduce the rate of

education loan. 39.3 percent of the respondents agreed that it is essential that institute must provide interest free education loans for underprivileged students, 46.3 percent of the respondents agreed that it is essential to reduce the cost of engineering by setting ceiling for engineering fee, 47.0 percent of the respondents agreed that it is essential to provide funds to engineering students for student exchange programmes, 47.7 percent of the respondents agreed that it is essential to have students interaction with industry experts to provide insight about the engineering program, 50.3 percent of the respondents agreed that setting up of counselling centers to provide snapshot of the course contents of engineering program to make students familiar with the engineering program is essential for engineering program.

4.2.20 To what extent following facilities are lacking and need to be improved in your institute?

Table No. 4.2.20 Facilities are lacking and need to be improved

Statements	Highly Essential	Essential	Moderately needed	Less Essential	Not at all essential
Proper internet facilities in campus	37.7	49.0	10.3	2.0	1.0
Equipments in laboratories	34.0	47.3	14.7	2.7	1.3
Library	39.3	43.7	12.3	4.0	.7
Computer Labs	36.7	47.7	13.7	1.3	.7
E- Learning resources	36.7	40.7	18.3	2.3	2.0
Incubation center	33.7	45.0	16.7	3.0	1.7
Entrepreneurship Cell	31.3	52.0	12.7	2.3	1.7

The above table described about the facilities, which are lacking and need to be improved in there institute. According to 49.0 percent of students it is essential to have proper internet facilities in campus. 47.3 percent of the respondents agreed that it

is essential that institute must provide equipment in laboratories, 43.7 percent of the respondents agreed that library is essential in institute, 47.7 percent of the respondents agreed that computer labs is essential in institute, 40.7 percent of the respondents agreed that E-Learning resources is essential in institute, 45.0 percent of the respondents agreed that incubation center is essential in institute, 52.0 percent of the respondents agreed that Entrepreneurship cell is essential in institute. These all facilities help in overall development of the engineering institute and helps in campus placement of students.

4.2.21 What major challenges did you face while searching for a Job?

Table No. 4.2.21 Regarding challenges faced by engineering aspirants during searching job

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Finding the right company to apply	33.7	48.0	17.0	.7	.7
Clearing interviews	30.7	41.3	23.3	4.0	.7
Clearing written test	29.7	40.7	24.3	3.3	2.0
Clearing Group Discussion	27.0	45.7	22.7	2.7	2.0
Appropriate remuneration offered by the company	28.3	46.0	21.7	3.3	.7
Insufficient ability as per the requirements of the industry	29.3	43.7	21.7	4.7	.7

The above table described about the challenges faced by the students while searching for a job. Result shows that 48.0 percent of student faced problem like finding the right company to apply to a great extent. 41.3 percent of the respondents faced problem like clearing interview to a great extent, 40.7 percent of the respondents faced problem like clearing written test to a great extent, 45.7 percent of the respondents faced problem like clearing group discussion to a great extent, 46.0 percent of the respondents faced problem like appropriate remuneration offered by the

company to a great extent and 43.7 percent of the respondents faced problem like insufficient ability as per the requirements of industry.

4.3 DATA ANALYSIS OF INDUSTRALISTS (HR PROFESSIONALS)

4.3.1 Opinion on the demand/desirability of requisite employability skills among engineering aspirants.

4.3.1.1 In the present question some Communication Skills are given please rate them on five-point Liker Scale from Most Desirable to Not At all desirable

Table No. 4.3.1.1 Rating of communication skills on the five-point Liker Scale from Most Desirable to Not At all desirable

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Basic written communication skills (English)	36.0	33.0	9.0	17.0	5.0
Basic verbal communication skills (English)	36.0	31.0	12.0	15.0	6.0
Effective Pronunciation	13.0	52.0	18.0	13.0	4.0
Active listening skills	27.0	43.0	9.0	18.0	3.0
Group Discussion skills	27.0	39.0	11.0	16.0	7.0
Presentation skills	45.0	21.0	12.0	17.0	5.0
Team communication skills	18.0	42.0	14.0	20.0	6.0
Formal communication skills	36.0	25.0	16.0	18.0	5.0
Ability to communicate in multiple languages	27.0	36.0	15.0	16.0	6.0

The above table depicted that nearby 33.0 per cent of the respondents thinks that the Basic written communication skills (English) should be desirable in students. 31.0 per cent of the respondents think that the Basic verbal communication skills (English) should be desirable in students 43.0 per cent are in favour of active listening skills,

which means the students who is looking for job in industries must be active listeners and understand what is delivered to them. 39.0 per cent of the respondents acknowledge that the group discussion skill should be desirable in students. 21.0 per cent of the respondents think that the Presentation skills should be desirable in students. 42.0 per cent of the respondents acknowledge that the Team communication skills should be desirable in engineering graduates so they can present the work in effective manner so as to be understood by others. 25.0 per cent of the respondents acknowledge that the formal communication skills should be desirable in engineering graduates. 36.0 per cent of the respondents think that the Ability to communicate in multiple languages should be desirable in students.

4.3.1.2 In the present question some Technical Skills are given please rate them on five-point Liker Scale from Most Desirable to Not At all desirable.

Table No. 4.3.1.2 Rating on Technical skills on five-point Liker Scale from Most Desirable to Not At all desirable

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Basic numeracy and computational skills	18.0	49.0	17.0	9.0	7.0
Database Analysis and Management skills	19.0	47.0	18.0	12.0	4.0
Basic fundamental knowledge of mathematics, science and engineering	20.0	36.0	27.0	14.0	3.0
Ability to design a system, component, or process to meet desired needs	22.0	29.0	25.0	18.0	6.0
Ability to identify, formulate, and solve engineering problems	23.0	38.0	19.0	13.0	7.0
Ability to apply knowledge of mathematics, science and engineering practically	20.0	41.0	20.0	14.0	5.0
In-depth technical competence in a specific engineering discipline	24.0	39.0	21.0	11.0	5.0

The above table, describe about the technical skills which is desirable for the students according to industry persons. Out of the total respondents 49.0 per cent suggested that Basic numeracy and computational skills is desirable for students. 47.0 per cent of the respondents think that engineering students should possess Database Analysis and Management skills. 36.0 per cent of the respondents suggested that Basic fundamental knowledge of mathematics, science and engineering is desirable for students. 29.0 per cent of the respondents suggested that engineering students should possess Ability to design a system, component, or process to meet desired needs. 38.0 per cent of the respondents suggested that engineering students should possess Ability to identify, formulate, and solve engineering problems. 41.0 per cent of the respondents suggested that engineering students should possess Ability to apply knowledge of mathematics, science and engineering practically. 39.0 per cent of the respondents suggested that engineering students should possess In-depth technical competence in a specific engineering discipline.

4.3.1.3 In the present question some Personal Attributes, Self Management Skills are given please rate them on five-point Likert Scale from Most Desirable to Not At all Desirable

Table.No. 4.3.1.3 Rating on personal attributes, self management skills on likert scale from most desirable to not at all desirable

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Self-discipline	19.0	45.0	21.0	10.0	5.0
Self- awareness	15.0	42.0	20.0	16.0	7.0
Self- motivation	20.0	36.0	27.0	14.0	3.0
Positive attitude	23.0	38.0	21.0	11.0	7.0
Ability to withstand difficult situations (Resilience)	18.0	43.0	22.0	12.0	5.0
Conflict negotiation and resolution skills	22.0	45.0	14.0	12.0	7.0
Being flexible as and when the situation demands	19.0	50.0	15.0	12.0	4.0
Ability to take initiatives	18.0	38.0	25.0	16.0	3.0
Ability to work under pressure	25.0	29.0	22.0	20.0	4.0
Effective time management skills	21.0	40.0	19.0	13.0	7.0
Effective leadership skills	18.0	43.0	22.0	12.0	5.0
Ability to work in teams	24.0	35.0	17.0	15.0	9.0
Ability to have an understanding of ethical responsibilities and their commitments towards them	21.0	40.0	19.0	14.0	6.0
Ability to accept professional responsibility and commitments	21.0	40.0	22.0	11.0	6.0
Social and intercultural adaptability	22.0	41.0	20.0	12.0	5.0

Nowadays the organization not only needs a technical aspirant to design software but an employee who possess some self-managerial and interpersonal skills as well. Out of the total respondents 45.0 per cent suggested that Self-discipline is desirable for students. 42.0 per cent of the respondents think that engineering students should possess self-awareness skills. 36.0 per cent of the respondents think that engineering students should possess self-motivation skills. 38.0 per cent of the respondents suggested that positive attitude is desirable for students. 43.0 per cent of the respondents suggested that engineering students should possess Ability to withstand difficult situations. 45.0 per cent of the respondents suggested that engineering students should possess Conflict negotiation and resolution skills. 50.0 per cent of the respondents suggested that engineering students should be being flexible as and when the situation demands. 38.0 per cent of the respondents suggested that engineering students should possess Ability to take initiatives. 29.0 per cent of the respondents suggested that engineering students should possess Ability to work under pressure. 40.0 per cent of the respondents suggested that engineering students should possess Effective time management skills. 43.0 per cent of the respondents suggested that engineering students should possess Effective leadership skills. 35.0 per cent of the respondents suggested that engineering students should possess Ability to work in teams. 40.0 per cent of the respondents suggested that Ability to have an understanding of ethical responsibilities and their commitments towards them is desirable for students. 40.0 per cent of the respondents suggested that Ability to accept professional responsibility and commitments is desirable for students. 41.0 per cent of the respondents suggested that Social and intercultural adaptability is desirable for students.

4.3.1.4 In the present question some Management and Entrepreneurial Skills are given please rate them on five-point Likert Scale from Most Desirable to Not At all desirable

Table No. 4.3.1.4 Rating on management & entrepreneurial skills on likert scale from most desirable to not at all desirable

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Courage and risk-taking ability	21.0	40.0	18.0	14.0	7.0
Critical thinking skills	20.0	41.0	24.0	10.0	5.0
Effective Decision-making skills	22.0	45.0	14.0	12.0	7.0
Curiosity	22.0	47.0	17.0	10.0	4.0
Creativity and innovation	18.0	38.0	28.0	13.0	3.0
Marketing of Concept/ Idea/ Product/ Service	23.0	31.0	22.0	20.0	4.0
Project management	20.0	41.0	19.0	13.0	7.0
Budget allocation and planning abilities	18.0	43.0	22.0	12.0	5.0
Task delegation	24.0	35.0	17.0	15.0	9.0
Organization management	19.0	42.0	21.0	12.0	6.0
Ability to evaluate and review performance	24.0	35.0	19.0	13.0	9.0
Ability to influence and persuade in order to achieve goals and objective	21.0	40.0	19.0	14.0	6.0

At the time of data collection, we come to know that engineering graduates lack in entrepreneurial and management skills as per industry persons. out of the total respondents 40.0 per cent suggested that courage and risk-taking ability is desirable

for students. 41.0 per cent of the respondents think that engineering students should possess critical thinking skills. 45.0 per cent of the respondents think that engineering students should possess effective decision-making skills. 47.0 per cent of the respondents suggested that curiosity is desirable for students. 38.0 per cent of the respondents suggested that engineering students should possess creativity and innovation. 31.0 per cent of the respondents suggested that engineering students should possess marketing of concept/ idea/ product/ service. 41.0 per cent of the respondents suggested that engineering students should have project management skills. 43.0 per cent of the respondents suggested that engineering students should possess budget allocation and planning abilities. 35.0 per cent of the respondents suggested that engineering students should possess task delegation skills. 42.0 per cent of the respondents suggested that engineering students should possess organization management skills. 35.0 per cent of the respondents suggested that engineering students should possess ability to evaluate and review performance. 40.0 per cent of the respondents suggested that engineering students should possess ability to influence and persuade in order to achieve goals and objective.

4.3.1.5 In the present question some Next Generation Skills are given please rate them on five-point Likert Scale from Most Desirable to Not At all desirable

Table No. 4.3.1.5 Rating on next generation skills on likert scale from most desirable to not at all desirable

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Big data analysis skills	24.0	35.0	17.0	15.0	9.0
Data warehousing and Data mining skills	21.0	40.0	19.0	14.0	6.0
Ability to write functionally correct code	25.0	29.0	22.0	20.0	4.0
Cyber security and Analytics skills	21.0	40.0	19.0	13.0	7.0
Machine learning	18.0	43.0	22.0	12.0	5.0
Robotics	24.0	35.0	17.0	15.0	9.0
Knowledge about cloud-based computing	21.0	40.0	19.0	14.0	6.0
Knowledge about Internet of things (IOT)	24.0	35.0	17.0	15.0	9.0
Knowledge about automation and artificial intelligence	21.0	40.0	19.0	14.0	6.0

In today's era of technological advancement, the need of next generation skill set is important. out of the total respondents 35.0 per cent suggested that big data analysis skills is desirable for students. 40.0 per cent of the respondents think that engineering students should possess data warehousing and data mining skills. 29.0 per cent of the respondents think that engineering students should possess ability to write

functionally correct code. 40.0 per cent of the respondents suggested that cyber security and analytics skills is desirable for students. 43.0 per cent of the respondents suggested that engineering students should possess machine learning. 35.0 per cent of the respondents suggested that engineering students should possess robotics. 40.0 per cent of the respondents suggested that engineering students should have knowledge about cloud-based computing skills. 35.0 per cent of the respondents suggested that engineering students should possess knowledge about internet of things (iot). 40.0 per cent of the respondents suggested that engineering students should possess knowledge about automation and artificial intelligence.

4.3.2 Do you think that following changes should be made to make engineering education more effective?

Table No. 4.3.2 Changes require making engineering education more effective

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Periodic review and updating of course curriculum	30.0	45.0	5.0	20.0	10.0
Improvement in quality of teaching and learning infrastructure	35.0	30.0	10.0	13.0	12.0
Workshops, conferences and seminars for school students	27.0	47.0	21.0	3.0	2.0
Entrepreneurial education and development programs	28.0	45.0	19.0	6.0	2.0
Faculty development and exchange programs for teachers	30.0	42.0	8.0	12.0	18.0

In order to make a college education more effective, there should be periodic review and updating of course curriculum and to enhance the knowledge of teachers there must be faculty development and exchange programs. In the above table, out of the total respondents, 30.0 per cent strongly agree that there should be Periodic review and updating of course curriculum. 35.0 per cent strongly agree that there should be Improvement in quality of teaching and learning infrastructure. 27.0 per cent of the respondents strongly agree that there must be Workshops, conferences and seminars for school students for there career development. 28 per cent of the respondents strongly agreed to have an understanding of entrepreneurial education and development programs, which will help them to innovate some new ideas of their own and do not depend on placements only. 30.0 per cent of the respondents strongly agree that to enhance the knowledge of teachers there must be faculty development and exchange programs.

4.3.3 Do you think that following changes should be require updating the course curriculum so that engineering education can be made more effective?

Table No. 4.3.3 Changes require updating the course curriculum

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Industry participation in designing the curriculum of engineering	24.0	52.0	8.0	10.0	6.0
Workshops, seminars, conferences and guest lectures by industry experts	35.0	46.0	6.0	10.0	3.0
Increasing the focus on learning through live projects and internships	40.0	29.0	23.0	5.0	3.0
Entrepreneurial education and development programs	32.0	53.0	6.0	6.0	3.0
Faculty development and exchange programs for engineering faculties	40.0	31.0	3.0	20.0	6.0
Industry sponsored labs and training centers in educational institutes	32.0	41.0	4.0	15.0	8.0
Industry sponsored incubation centers	20.0	50.0	10.0	8.0	12.0
Organizing and Motivating faculties to undertake research and development workshops, seminars and conferences	23.0	34.0	16.0	24.0	3.0

In order to make a college education more effective, there should be updating of course curriculum by industry person and colleges should focus on entrepreneurial education and development programs. In the above table, out of the total respondents, 52.0 per cent agree that there should be Industry participation in designing the curriculum of engineering. 46.0 per cent strongly agree that there should be workshops, seminars, conferences and guest lectures by industry experts. 40.0 per

cent of the respondents strongly agree that colleges should Increase the focus on learning through live projects and internships. 32 per cent of the respondents strongly agreed that colleges should focus on entrepreneurial education and development programs to make college education more effective. 40.0 per cent of the respondents strongly agree that there should be faculty development and exchange programs for engineering faculties to enhance the knowledge of teachers. 32.0 per cent of the respondents strongly agree that institution should focus on industry sponsored labs and training centers in educational institutes. 20.0 per cent of the respondents strongly agree that institution should focus on industry sponsored incubation centers. 23.0 per cent of the respondents strongly agree that institution should motivate faculties to undertake research and development workshops, seminars and conferences.

4.3.4 Do you think that following measures/initiatives should be undertaken by the government for reducing the skill gap?

Table No. 4.3.4 Measures/initiatives should be undertaken by the government for reducing the skill gap

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Increasing collaboration between industries and educational institutes through various modes such as public private partnerships and special purpose vehicles	30.0	40.0	5.0	15.0	10.0
Developing government sponsored skill development labs for engineering students	31.0	38.0	4.0	15.0	12.0
Providing funds to encourage the institutions and students to develop innovative and practical projects	28.0	42.0	4.0	16.0	6.0
Creation of Industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects	20.0	43.0	8.0	19.0	10.0
Creation of incubation centers keeping in view local industry ecosystem requirements	19.0	40.0	10.0	6.0	15.0

Employment generation is the important indicator of economic development so government should take initiatives for reducing the skill gap. In the above table, out of the total respondents, 40.0 per cent agree that government should increase the collaboration between industries and educational institutes through various modes

such as public private partnerships and special purpose vehicles. 38.0 per cent strongly agree that skill gap can be reduced by developing government sponsored skill development labs for engineering students. 42.0 per cent of the respondents strongly agree that government should provide funds to encourage the institutions and students to develop innovative and practical projects. 43 per cent of the respondents agreed for creation of Industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects. 40.0 per cent of the respondents agree that creation of incubation centers keeping in view local industry ecosystem requirements will reduce the skill gap.

4.3.5 Do you think following economic and global factors are directly and indirectly responsible for skill mismatch in Madhya Pradesh?

Table No. 4.3.5 Economic and global factors responsible for skill mismatch

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Lack of Foreign Direct Investment and Industrial Investment	28.0	42.0	6.0	15.0	9.0
Cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living	37.0	32.0	4.0	17.0	10.0
Lack of job opportunities	38.0	32.0	2.0	18.0	6.0
Slowdown in the economy due to lack of growth and inflation	20.0	43.0	8.0	20.0	9.0
Low expenditure on education sector by Government due to fiscal constraints	13.0	46.0	10.0	6.0	15.0

In the above table, out of the total respondents, 42.0 per cent agree that lack of foreign direct investment and industrial investment is an economic factor which is responsible for skill mismatch in Madhya Pradesh. 32.0 per cent agree that cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living is an global factor which is responsible for skill mismatch in Madhya Pradesh. 38.0 per cent of the respondents strongly agree that lack of job opportunities is an important factor for skill mismatch in Madhya Pradesh. 43 per cent of the respondents agreed that slowdown in the economy due to lack of growth and inflation is an economic factor which is responsible for skill mismatch in Madhya Pradesh. 46.0 per cent of the respondents agree that low expenditure on education sector by government due to fiscal constraints is an economic factor which is responsible for skill mismatch in MADHYA Pradesh.

4.3.6 What measures could be undertaken to attract more industries in Madhya Pradesh?

Table No. 4.3.6 Measures to attract more industries in Madhya Pradesh

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Reducing the cost of establishing industries in Madhya Pradesh	38.0	48.0	3.0	5.0	6.0
Reducing the cost of transportation for industries	25.0	44.0	6.0	15.0	10.0
Reducing the cost of electricity and fuel	39.0	41.0	3.0	10.0	7.0
Reducing the rate of taxes for industries	30.0	35.0	10.0	13.0	12.0
Reducing red tapism and number of permissions required for setting up of industries	26	44	7.0	12.0	11.0

In the above table, out of the total respondents, 48.0 per cent agree that government should reduce the cost of establishing industries in Madhya Pradesh to attract more industries

for economic development. 44.0 per cent agree that government should reduce the cost of transportation for industries to attract more industries for economic development. 41.0 per cent of the respondents agree that reducing the cost of electricity and fuel for industries helps government to attract more industries for investment. 35.0 per cent of the respondents agreed that government should reduce the rate of taxes for industries to attract more industries for economic development. 44.0 per cent of the respondents agree that Reducing red tapism and number of permissions required for setting up of industries helps government to attract more industries for investment.

4.3.7 In your opinion what would be the consequences of mismatch between demand and supply of requisite skills?

Table No. 4.3.7 Consequences of mismatch between demand and supply of requisite skills

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Decrease in the number of enrollments and closure of engineering institutes	30.0	29.0	3.0	26.0	12.0
Decrease in the employability of engineering students	35.0	32.0	6.0	15.0	12.0
Deviation of students to other graduate programs and certification courses	20.0	33.0	10.0	20.0	17.0
Lack of innovation and creativity	27.0	34.0	6.0	23.0	10.0
Lack of investment in education sector	24.0	42.0	4.0	22.0	8.0
Increase in recruitment of substandard workforce	21.0	36.0	5.0	20.0	18.0
Increase in dependence on Automation and Robotics due to lack of skilled workforce	20.0	25.0	5.0	30.0	20.0
Decrease in companies / organizations visiting engineering institutes for placement.	27.0	35.0	5.0	20.0	13.0
Increase in social, mental and health care problems	28.0	33.0	6.0	23.0	10.0

There are many reasons due to which the gap of demand and supply of the requisite skills by the industry and engineering aspirants is increasing, which lead to many consequences. In the above table, majority of respondents strongly agree to decrease in the number of enrolments and closure of engineering institutes. 32.0 per cent of the respondents agree for Decrease in the employability of engineering students. 33.0 per cent of the respondents agree for deviation of students to other graduate programs and certification courses. 34.0 per cent of the respondents agree to Lack of innovation and creativity. 42.0 per cent of the respondents agree to Lack of investment in education sector 36.0 per cent of the respondents agree to increase the recruitment of substandard workforce. 25.0 per cent of the respondents agree to increase in dependence on automation and robotics due to lack of skilled workforce. 35.0 per cent of the respondents agree to decrease in companies / organizations visiting engineering institutes for placement. 33.0 per cent of the respondents agree to increase in social, mental and health care problems.

4.3.8 In your opinion, what measures should be undertaken to create effective training program in order to provide engineering workforce tailor made for industries?

Table No. 4.3.8 Measures undertake to create effective training

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Increase interaction between educational institutes and industries	31.0	45.0	3.0	12.0	9.0
Providing interdisciplinary training in order to improve requisite skills in engineering aspirants	22.0	41.0	6.0	19.0	13.0
Development of feedback mechanism to review effectiveness of training program	33.0	41.0	4.0	15.0	7.0
Development of Industry oriented training programs specifically designed with the help of industry experts	30.0	35.0	16.0	17.0	12.0
Establishing Industrial Mentorship programs to drive learning and development for both mentor and mentee	26.0	42.0	3.0	16.0	13.0
Establishing industry sponsored training labs and apparatus in educational institutes	30.0	46.0	3.0	13.0	8.0
Training should be imparted by expert of that particular field	25.0	44.0	4.0	15.0	12.0
Increasing the time duration of training	34.0	41.0	3.0	10.0	12.0

Engineering institute should provide effective training program in order to provide engineering workforce tailor made for industries. In the above table, out of the total respondents, 45.0 per cent agree that there must be Increase interaction between educational institutes and industries. 41.0 per cent strongly agree that institute should provide interdisciplinary training in order to improve requisite skills

in engineering aspirants. 41.0 per cent of the respondents agree that institute must develop feedback mechanism to review effectiveness of training program. 35 per cent of the respondents agreed for development of Industry oriented training programs specifically designed with the help of industry experts. 42.0 per cent of the respondents agree for establishing industrial mentorship programs to drive learning and development for both mentor and mentee. 46.0 per cent of the respondents agree for establishing industry sponsored training labs and apparatus in educational institutes. 44.0 per cent of the respondents agree that Training should be provided by expert of that particular field. 41.0 per cent of the respondents agree for Increasing the time duration of training.

4.4 DATA ANALYSIS OF ENGINEERING ACADEMICIANS

4.4.1 Distribution of the respondents according to Type of Institution

Table No. 4.4.1 Distribution of the respondents according to Type of Institution

Type of Institute	**N**	**%**
Private	108	39.27
semi- government	31	11.27
Government	136	49.45
Total	**275**	**100.00**

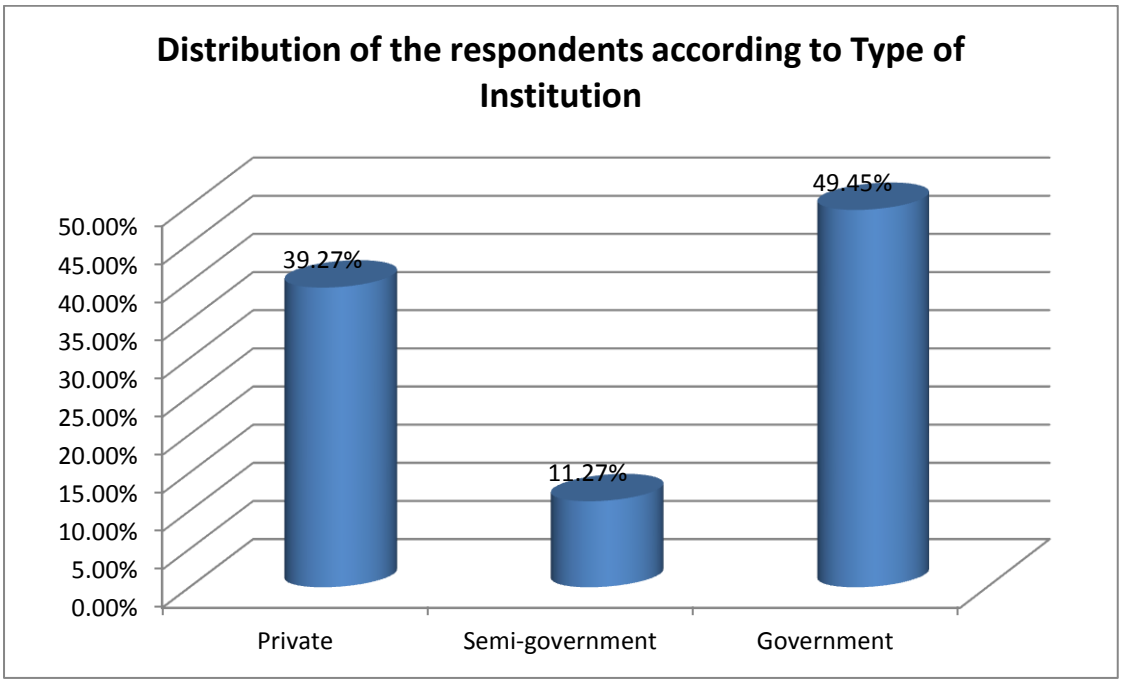


Fig. 4.4.1 Analysis of respondents according to type of institution

The above table of distribution shows that out of the total 275 respondents 49.45 per cent are from government institutes, 39.27 per cent are from private Engineering institutes and remaining 11.27 per cent are from semi government engineering institutes. The majority of our respondents are working in government institutes.

4.4.2 Distribution of the respondents according to age

Table No. 4.4.2 Distribution according to Age

Age Group	**N**	**%**
Up to 40 yrs	110	40.00
40-50 yrs	96	34.91
50-60 yrs	65	23.64
Above 60 yrs.	4	1.45
Total	**275**	**100**

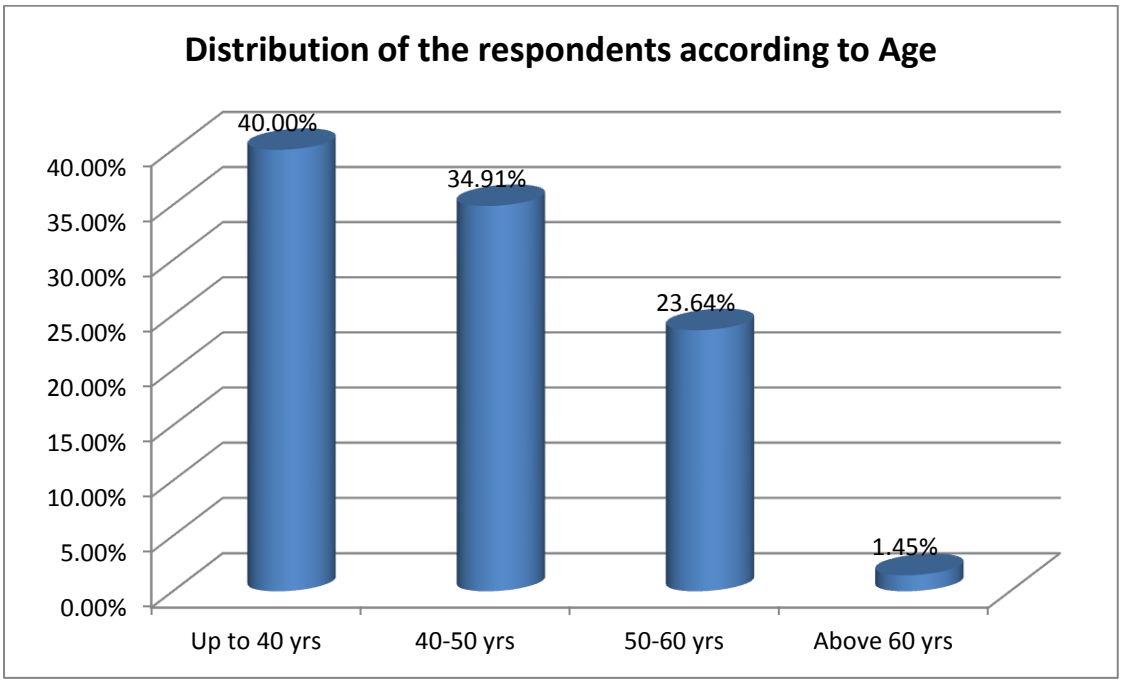


Fig. 4.4.2 Analysis of respondents according to age

The above table of distribution shows that out of the total 275 respondents 40 per cent are up to the age of 40 years, 34.91 per cent are in between 40 to 50 years, 23.64 per cent are between 50 to 60 years, and remaining 1.45 per cent are above 60 years working in Engineering Institutes. The majority of the respondents are young generation.

4.4.3 Distribution of the respondents according to Gender

Table No. 4.4.3 Distribution according to gender

Gender	**N**	**%**
Male	226	82.18
Female	49	17.82
Total	**275**	**100.00**

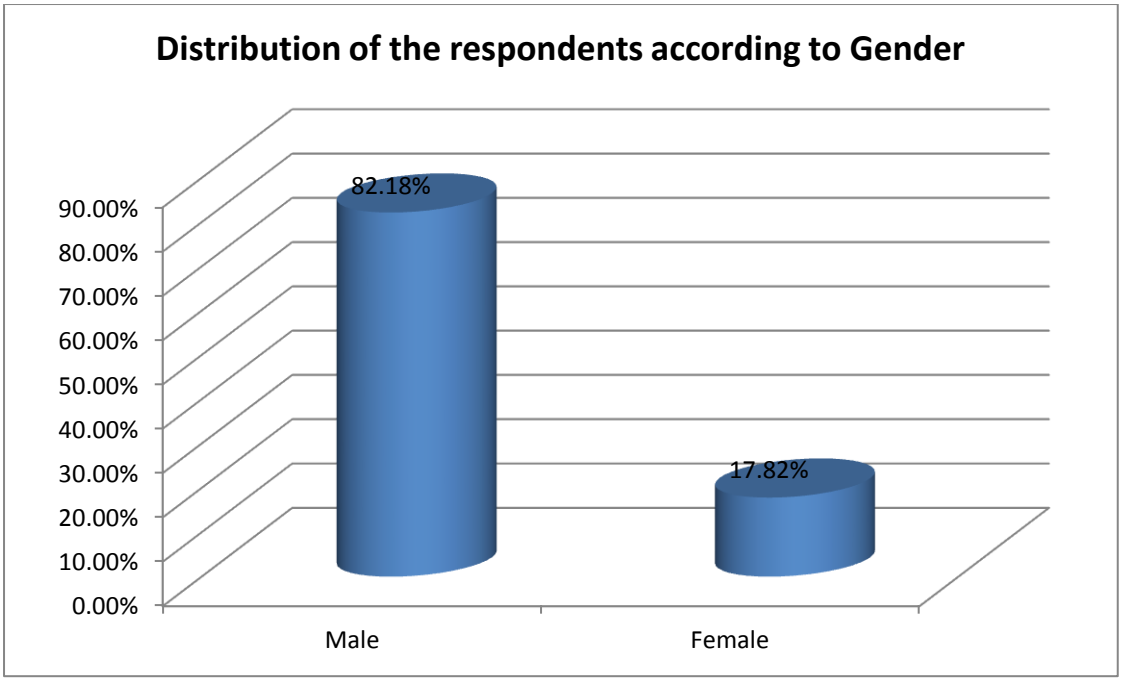


Fig. 4.4.3 Distribution according to Gender

The above table of distribution shows that out of the total 275 respondents 82.18 per cent was male and remaining 17.82 per cent were female in the engineering institutes. The majorities of respondents are male working in government institutes and are young adults.

4.4.4 Distribution of respondents according to education

Table No. 4.4.4 Distribution according to Education

Education	**N**	**%**
MBA	2	0.73%
M. Tech	110	40.00
PH. D	158	57.45
Other	5	1.82
Total	**275**	**100.00**

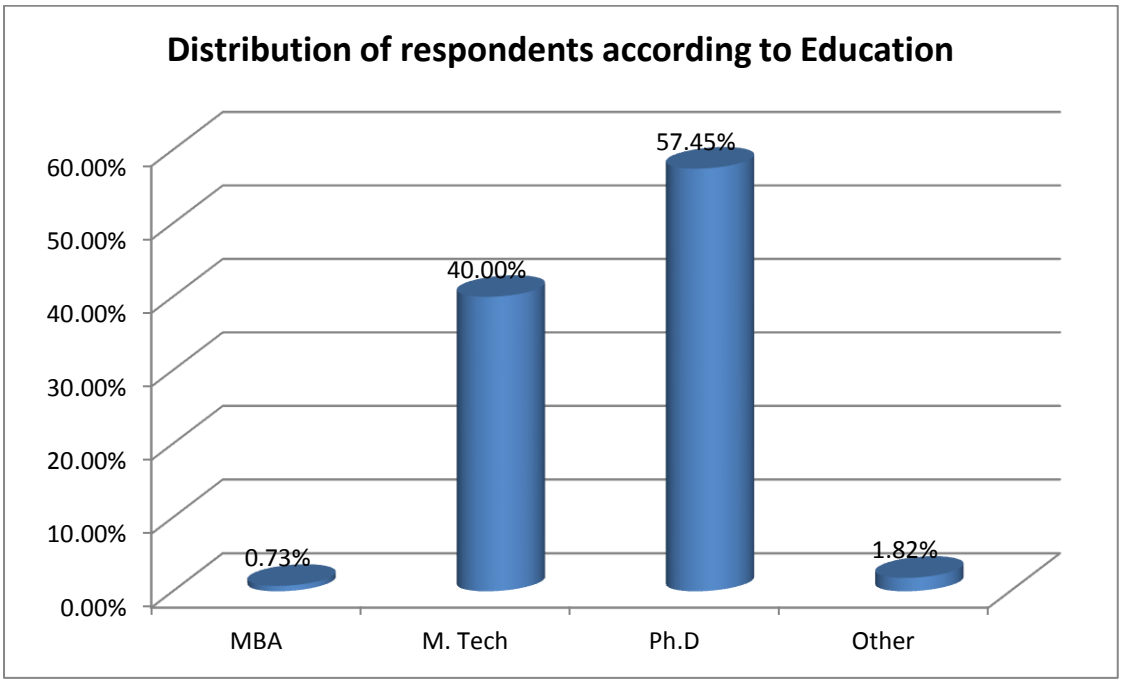


Fig. 4.4.4 Distribution according to education

The above table of distribution shows that out of the total 275 respondents 57.45 per cent were Ph.D., 40 per cent were M.Tech or Post Graduates, 1.82 per cent were other than engineering degrees like diploma or any other graduate or post graduate degree, 2 per cent were MBA. The majority of respondents are highly qualified with PhD degree.

4.4.5 Distribution according to experience in academics

Table No. 4.4.5 Distribution according to experience in Academics

Experience	**N**	**%**
Up to 5 yrs	27	9.82
5-10 yrs	62	22.55
10-15 yrs	74	26.91
15-20 yrs	34	12.36
20-25 yrs	39	14.18
Above 25 yrs	39	14.18
Total	**275**	**100.00**

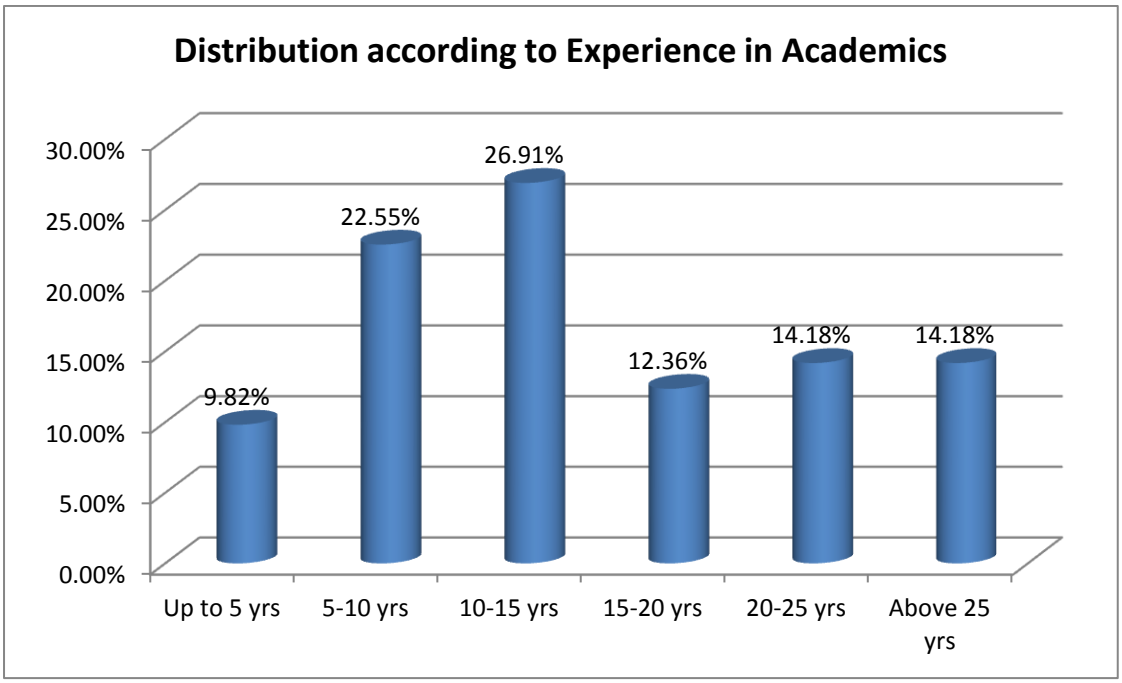


Fig. 4.4.5 Distribution according to experience in academics

The above table of distribution shows that out of the total 275 respondents 26.91 per cent was 10 to 15 years of experience in academics, 22.55 per cent was 5 to 10 years of experience, 14.18 per cent was 20 to25 years of experience, 14.18 per cent was above 25 years of experience, 12.36 per cent were 15 to 20 years of experience, and

remaining 9.82 per cent were young and holds up to 5 years of experience in academics. The majority of respondents were having good experience up to 15 years in academics.

4.4.6 Distribution of respondents according to experience in Industry

Table No. 4.4.6 Distribution according to experience in industry

Experience	**N**	**%**
No Experience	70	25.45
1 Year	31	11.27
2 Years	46	16.73
3 Years	43	15.64
4 Years	30	10.91
Above 4 Years	55	20.00
Total	**275**	**100.00**

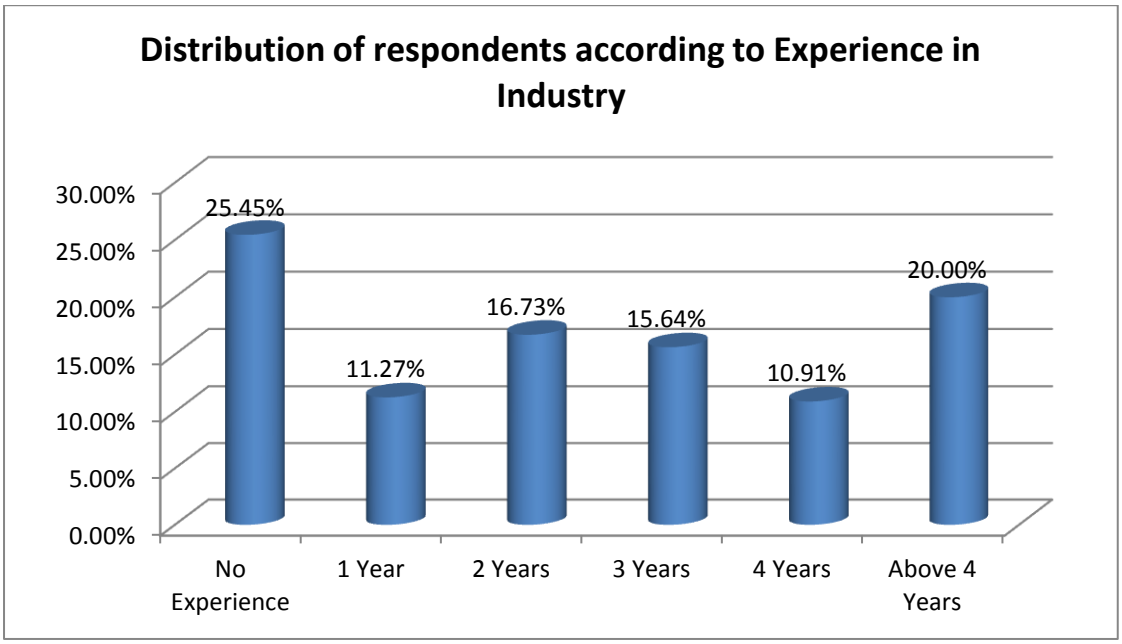


Fig. 4.4.6 Distribution according to experience in industry

The above table of distribution shows that out of the total 275 respondents 25.45 per cent was not having any experience in the working of industries, 20 per cent was having more than 4 years of experience, 16.73 per cent was having 2 years of experience, 15.64 per cent was 3 years of experience, 11.27 per cent was having 1 year of experience, and remaining 10.91 per cent was having 4 years of experience in Industry working in engineering institutes. The majority of respondents do not possess any industrial experience, so the student to be acknowledged by the industry is difficult.

4.4.7 Distribution of respondents according to designation

Table No. 4.4.7 Distribution according to designation

Designation	**N**	**%**
Associate professor	65	23.64
Assistant professor	133	48.36
Professor	77	28.00
Total	**275**	**100.00**

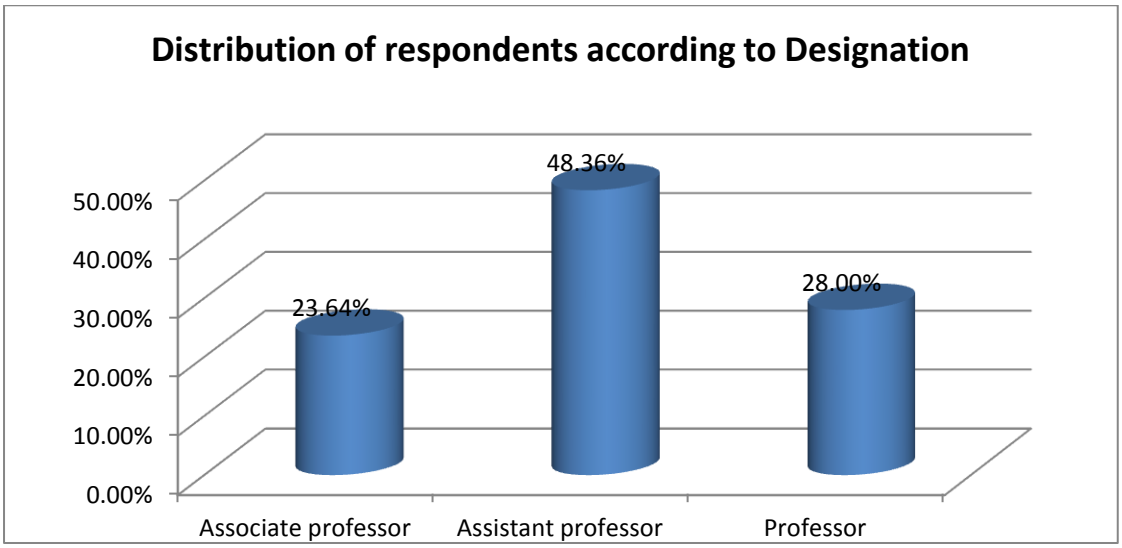


Fig. 4.4.7 Distribution according to designation

The above table of distribution shows that out of the total 275 respondents 48.36 per cent was assistant professor, 28 per cent was Professor and remaining 23.64 per cent was associate professor in the engineering institutes. The majority of the respondents is assistant professor and has good knowledge about the subject.

4.4.8 Distribution of respondents according to Discipline

Table No. 4.4.8 Distribution according to discipline

Discipline	**N**	**%**
Electrical/Electronics/Communication	34	12.36
Mechanical	109	39.64
Computer Science/IT	80	29.09
Other	6	2.18
Biotechnology	2	0.73
Civil	44	16.00
Total	**275**	**100.00**

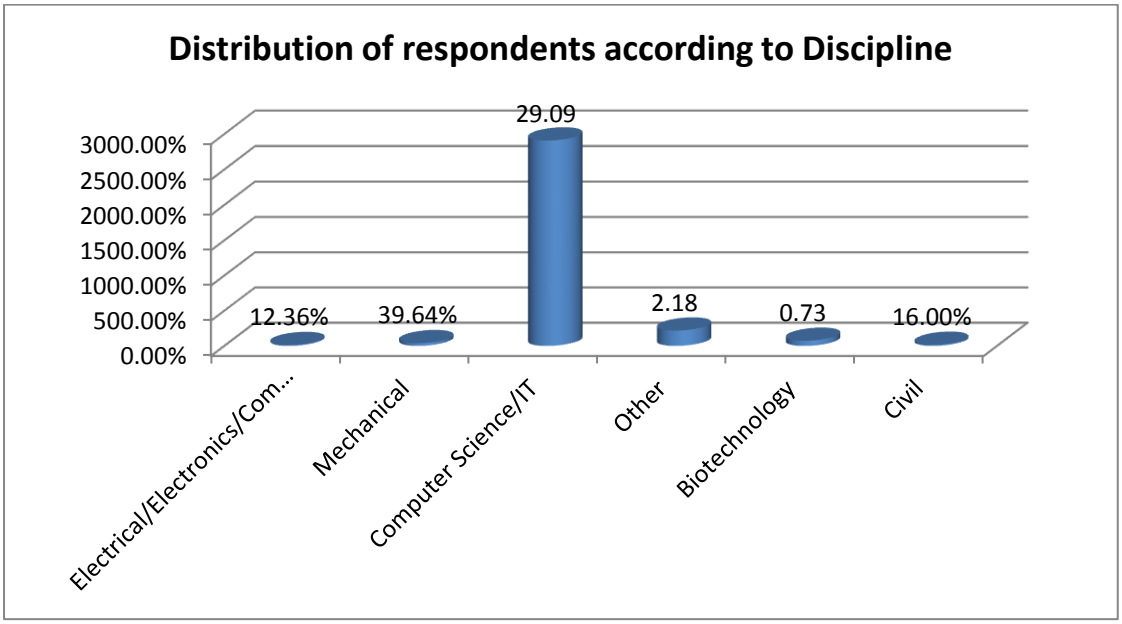


Fig. 4.4.8 Distribution according to Discipline

The above table of distribution showed that out of total 275 respondents 39.64 per cent was from mechanical branch, 29.09 per cent of respondents was from Information Technology or computer science, 16 per cent was from civil, 12.36 per cent was from communication/electronics/electrical, 2.18 per cent was from other branches, and remaining 0.73 per cent was from biotechnology in the engineering institutes. The majority of respondents are from mechanical branch in which the placement needs the core company and practical knowledge as well.

4.4.9 Availability of Communication skills among engineering students in the view of Academicians

Table No. 4.4.9 Availability of communication skills among engineering students

Skill	Completely missing	At Very low level	At Average level	At Fairly high level	Outstanding	Rank
Basic written communication skills (English)	6.18	21.09	60.73	9.82	2.18	6
Basic verbal communication skills (English)	8.00	17.82	59.64	10.18	4.36	4
Effective Pronunciation	3.64	20.00	61.82	11.64	2.91	1
Active listening skills	8.36	15.27	61.09	10.91	4.36	2
Group Discussion skills	6.18	17.82	62.55	9.82	3.64	3
Presentation skills	5.82	21.82	58.18	11.64	2.55	5
Team communication skills	7.64	21.09	59.27	8.73	3.27	7
Formal communication skills	7.64	21.45	60.73	5.82	4.36	8
Ability to communicate in multiple languages	6.18	25.45	60.73	5.09	2.55	9

The above table depicted that nearby 61.82 per cent of the respondents thinks that the students possess an effective pronunciation skill at an average level. 61.09 per cent are in favour of active listening skills at average level, which means the students are active listeners and understand what is delivered to them. 62.55 per cent of the

respondents acknowledge the group discussion skill in the students at an average level. This means the discussion on a topic helps them to understand it and grab the information attained from others. 59.64 per cent of the respondents picked up the basic verbal communication (English) skill at an average level, means the students can understand English language, and speak the basic. 58.18 per cent of the respondents agree on the presentation skill at an average level. The engineering graduates can present the work in effective manner so as to be understood by others.

4.4.10 Availability of technical Skills among engineering students in view of Academicians

Table No. 4.4.10 Availability of technical skills among engineering students

Technical Skill	Completely missing	At Very low level	At Average level	At Fairly high level	Outstanding	Rank
Basic numeracy and computational skills	14.55	28.36	51.64	4.00	1.45	7
Database Analysis and Management skills	7.27	25.82	59.64	5.82	1.45	3
Basic fundamental knowledge of mathematics, science and engineering	9.09	21.82	62.55	5.45	1.09	4
Ability to design a system, component, or process to meet desired needs	8.73	16.73	64.36	8.00	2.18	1
Ability to identify, formulate, and solve engineering problems	14.18	23.64	52.73	9.09	0.36	6
Ability to apply knowledge of mathematics, science and engineering practically	13.45	21.45	54.91	9.82	0.36	5
In-depth technical competence in a specific engineering discipline	6.18	28.00	54.55	7.64	3.64	2

In the above table, the students possess the ability to design a system, component, or process to meet desired needs at an average level responded by 64.36 per cent of the academicians. Out of the total respondents 54.55 per cent suggested that an in-depth

technical competence in a specific engineering discipline at an average level. 59.64 per cent of the respondents thinks that engineering students possess database analysis and management skills at an average level. 62.55 per cent of the respondents opted that students are enabled with the basic fundamental knowledge of mathematics, science and engineering. 54.91 per cent of the respondents acknowledged the ability to apply knowledge of mathematics, science and engineering practically. The engineering students possess the ability to identify, formulate and solve engineering problems at an average level, is given by 52.73 per cent of the respondents. 51.64 per cent of the respondents think that the engineering students possess the basic numeracy and computational skills at an average skill.

4.4.11 Availability of personal attributes self-management skills and interpersonal skills among engineering students in the view of Academicians

Table No. 4.4.11 Availability of personal attributes self-management skills and interpersonal skills among engineering aspirants

Personal attributes, Self-Management skills and interpersonal Skills	Completely missing	At Very low level	At Average level	At Fairly high level	Outstanding	Rank
Self-discipline	13.82	26.91	52.00	6.55	0.73	14
Self- awareness	7.64	25.82	58.55	6.18	1.82	5
Self- motivation	8.73	20.36	63.64	5.45	1.82	2
Positive attitude	10.91	21.09	59.27	7.27	1.45	7
Ability to withstand difficult situations (Resilience)	10.18	23.27	59.27	5.45	1.82	9
Conflict negotiation and resolution skills	10.91	25.82	55.27	5.82	2.18	8
Being flexible as and when the situation demands	12.00	22.55	57.82	5.09	2.55	13
Ability to take initiatives	14.18	19.64	59.64	5.45	1.09	12
Ability to work under pressure	10.91	23.64	57.45	5.82	2.18	11
Effective time management skills	9.82	27.27	54.55	6.18	2.18	10
Effective leadership skills	8.36	25.45	58.55	6.18	1.45	6
Ability to work in teams	9.45	22.91	57.45	8.36	1.82	4
Ability to have an understanding of ethical responsibilities and their commitments towards them	7.64	29.82	54.18	6.91	1.45	3
Ability to accept professional responsibility and commitments	13.09	18.18	58.91	7.64	2.18	2
Social and intercultural adaptability	9.82	21.82	58.91	5.45	4.00	1

Nowadays the organizations not only need a technical aspirant to design software but an employee who possess some self-managerial and interpersonal skills as well. The table analyzed above depicted that 58.91 per cent of the respondents thinks that students possess social and intercultural adaptability skills at an average level. 63.64 per cent of the respondents own self-motivation, ability to understand, acknowledge and value other cultures and diversity skills at an average level. 57.45 per cent of the respondents think that engineering graduates possess an ability to work in teams at an average level.

4.4.12 Availability of Management and Entrepreneurial Skills among engineering students in view of Academicians

Table No. 4.4.12 Availability of management and entrepreneurial skills among engineering students

Management and entrepreneurial skill	Completely missing	At Very low level	At Average level	At Fairly high level	Outstanding	Rank
Courage and risk-taking ability	14.91	26.55	55.64	2.18	0.73	8
Critical thinking skills	9.82	18.91	66.91	4.00	0.36	2
Effective Decision-making skills	8.00	22.18	64.00	5.09	0.73	1
Curiosity	10.18	22.55	60.73	5.82	0.73	4
Creativity and innovation	10.91	22.91	60.00	5.45	0.73	3
Marketing of Concept/ Idea/ Product/ Service	10.91	23.27	58.18	6.91	0.73	5
Project management	12.73	23.64	57.09	5.45	1.09	6
Budget allocation and planning abilities	4.73	31.27	58.55	4.73	0.73	7

At the time of data collection, we come to know that engineering graduates lack in entrepreneurial and management skills as per academicians. After analyzing the data collected through questionnaire, 64 per cent of the respondents think that engineering graduates possess effective decision-making and curiosity skills at an average level. 58.18 per cent of the respondents acknowledged that marketing of concept/idea/product service and project management skills at an average level. 66.91 per cent of the respondents suggested that students of engineering possess critical thinking and creativity and innovation skills at an average level. 58.55 per cent of the respondents thinks that students possess budget allocation and planning abilities at an

average level. 55.64 per cent of the respondents suggested that students possess courage and risk-taking ability skills at an average level.

4.4.13 Availability of Next Generation Skills among engineering students in view of Academicians

Table No. 4.4.13 Availability of next generation skills among engineering students

Next Generation Skill	Completely missing	At Very low level	At Average level	At Fairly high level	Outstanding	Rank
Big data analysis skills	14.91	26.55	55.64	2.18	0.73	8
Data warehousing and Data mining skills	9.82	18.91	66.91	4.00	0.36	2
Cyber security and Analytics skills	8.00	22.18	64.00	5.09	0.73	1
Machine learning	10.18	22.55	60.73	5.82	0.73	4
Robotics	10.91	22.91	60.00	5.45	0.73	6
Knowledge about cloud-based computing	10.91	23.27	58.18	6.91	0.73	5
Knowledge about Internet of things (IOT)	12.73	23.64	57.09	5.45	1.09	7
Knowledge about automation and artificial intelligence	4.73	31.27	58.55	4.73	0.73	3

In today's era of technological advancement, the need of next generation skill set is important. According to 64 per cent respondents, the students possess cyber security and analytics skills at an average level. 66.91 per cent of the respondents thinks that engineering graduates possess data warehousing and data mining skills at an average

level. Out of the total respondents, 58.55 per cent of them suggested that engineering students possess knowledge about automation and artificial intelligence skills at an average level. 60.73 per cent of the respondents thinks that students possess machine learning skills at an average level. Out of the total respondents 58.18 per cent suggested that graduates completing engineering possess knowledge about cloud-based computing skills at an average level. 60 per cent of the respondents thinks that students possess robotic as next generation skill at an average level. 57.09 per cent of the respondents suggested that students have knowledge about internet of things (IOT) at an average level. 55.64 per cent of the respondents acknowledged that students in engineering have big data analysis skills at an average level.

4.4.14 Unavailability of requisite skills is one of the major reasons for high unemployment in engineering field

Table No. 4.4.14 Unavailability of requisite skills is the reason of unemployment

LEVEL OF AGREEMENT	N	%
Strongly Agree	139	50.55
Agree	128	46.55
Neutral	6	2.18
Disagree	2	0.73
Strongly Disagree	0	0.00
Total	**275**	**100.00**

The academicians from different institutes focused on the fact that availability of skills is hampering the growth of the engineering graduates and not getting required jobs. In the above table out of the total respondents 50.55 per cent strongly agreed on the point that unavailability of the requisite skills is one of the major reasons for high unemployment in engineering field. 46.55 per cent of the respondents agree that

requisite skills are lacking amongst engineering graduates and it is one of the major reasons for high unemployment. 2.18 per cent are neutral and neither they agree or disagree on the unavailability of the requisite skills as one of the reasons of unemployment in engineering field. 0.73 per cent of the respondents disagree that skills are one of the reasons for high unemployment in engineering field.

4.4.15 Need to restructure the governing body of school education in order to make it more relevant for the dynamic needs and challenges in educational field

Table No. 4.4.15 Need to restructure the governing body of school education

LEVEL OF AGREEMENT	N	%
Strongly Agree	93	33.82
Agree	152	55.27
Neutral	26	9.45
Disagree	2	0.73
Strongly Disagree	2	0.73
Total	**275**	**100.00**

Apart from employability skills the engineering graduates need to nurture the basic education possess in the school. The academicians suggested that school education is very basic and important, as it helps to develop the personality of the student. The skills that are needed for the placement should develop from the basic education. The institutes add on some skills necessary in the market into the skills they already possess at the time of school. In the above table out of the total 275 respondents 55.27 per cent agree that there is a need to restructure the governing body of school education in order to make it more relevant for the dynamic needs and challenges in education field. 33.82 per cent of the respondents strongly agreed that need to restructure the governing body of school education in order to make it more relevant

for the dynamic needs and challenges in education field. 9.45 per cent of the respondents are neutral and neither agree nor disagree that there is a need to restructure the governing body of school education in order to make it more relevant for the dynamic needs and challenges in education field.

4.4.16 Changes that should be implemented in our school education system

Table No. 4.4.16 Changes require implementing in school education system

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Rank
Learning through practical projects, workshops, case studies and seminars	0.00	0.00	4.36	60.36	35.27	1
Introduction of debates and presentations in the classroom	0.00	1.09	7.64	64.00	27.27	4
Periodic updating of course curriculum	0.00	1.45	13.82	58.91	25.82	7
Effective quality of teaching & learning infrastructure	0.00	1.82	10.91	58.91	28.36	6
Appropriate teacher-student ratio in class room	0.00	2.55	9.82	56.36	31.27	5
Introduction of personality development courses in schools	0.36	0.73	6.91	61.09	30.91	2
Entrepreneurship development courses for school students	0.00	0.73	7.64	63.64	28.0	3

In order to make a career ahead, the basic education needs to be strong. Individual attitude and personality development are built by the school education. In the above table, out of the total respondents, 35.27 per cent strongly agree that at the time of school education learning through practical projects, workshops, case studies and seminars will make the students to have a better understanding of the concepts. 30.91 per cent of the respondents strongly agree that students must introduce with the

personality development courses so that they get an idea to improve themselves and understand to react in different situations. 28 per cent of the respondents strongly agreed to have an understanding of entrepreneurship development courses in schools, which will help them to innovate some new ideas of their own and do not depend on placements only. 27.27 per cent of the respondents strongly agree that students must be taught with the help of debates and presentation so that they will get the clearance of the concept as well as removal of all the doubts they build up in their minds but unable to ask due to some reason. 31.27 per cent of the respondents strongly agree that there must be appropriate student-teacher ratio in classroom. Excess of students under the guidance of one teacher will not be handled properly and less students with more teachers will create a confusion. 28.36 per cent of the respondents strongly agree that there must be effective quality of teaching and learning infrastructure for the students. This will help the students to increase their interest in learning and being regular. 25.82 per cent of the respondents strongly agree that there is the need of periodic updating of the curriculum which will make the students remain updated with the new techniques and inventions.

4.4.17 Need of career guidance centers for the students at school level

Table No. 4.4.17 Need of career guidance centers for the students at school level

LEVEL OF AGREEMENT	N	%
Strongly Agree	162	58.91
Agree	103	37.45
Neutral	9	3.27
Disagree	1	0.36
Strongly Disagree	0	0.00
Total	**275**	**100.00**

At the time of data collection, the academicians suggested that some students do not opt engineering as their own career choice but influenced from other relatives, family pressure or friends. So, it is important to suggest and guide them to make a career of their choice and not influenced from others. In the above table, out of the total 275 respondents, 58.91 per cent strongly agree that there is a need of career guidance centers for the students at school level. 37.45 per cent respondents agree that students must be guided at school level for choosing the right career of their interest. 3.27 per cent respondents are neutral and they neither agree nor disagree on establishing career guidance centers for the students at school level. 0.36 per cent of the respondents also disagree that there is no need for career guidance centers for students at school level, as they can discuss with their parents, relatives and others.

4.4.18 Need to improve the teaching pedagogy of engineering faculties

Table No. 4.4.18 Improvements in teaching pedagogy

LEVEL OF AGREEMENT	N	%
Strongly Agree	90	32.73
Agree	54	19.64
Neutral	101	36.73
Disagree	29	10.55
Strongly Disagree	1	0.36
Total	**275**	**100.00**

When we asked engineering students about their course and faculties, we found that students do not want the old pattern of rote learning or just the conceptual learning. They want a mix of practical and conceptual acquaintances. They need to improvise and evolve new methods of teaching, which not only make them learn the concepts but also understand it well. In the above table, out of the total 275 respondents, 32.73

per cent of the respondents strongly agree that teaching pedagogy need to be improved. Majority of the respondents thinks that students gets bored of attending the lectures one after the other. They need more time for practical exposure and gather more practical experience, rather than just understanding concepts in the classroom. 19.64 per cent of the employees agree that there is a need to improve the teaching pedagogy of engineering faculties. Most of the respondents thinks that change in the patterns of the teaching will enhance the interest of those students as well who chose engineering not as their own choice but due to family pressure or any other influential factor. 36.73 per cent of the respondents was neutral on improvement in the teaching pedagogy of engineering students as they believe that teachers are delivering their best and are bind to perform their task as per university or any higher authority rules and regulations. 10.55 per cent of the respondents disagree that there is no need to improve the teaching pedagogy of engineering faculties. They are well versed and qualified in their field and concepts. 0.36 per cent of the employees strongly disagree that there is a need to improve the teaching pedagogy of engineering faculties. They believe if the students are willing to learn, they will get, no matter how the teacher is teaching in the classroom.

4.4.19 Steps that should be taken to improve the teaching pedagogy

Table No. 4.4.19 Steps to improve teaching pedagogy

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Rank
1. Conferences, seminars, webinars, workshops, guest lectures and training programs by industry experts for faculties.	0.00	0.00	3.64	64.73	31.64	1
2. Faculty development and exchange programs with renowned National and International institutes	0.00	1.82	12.73	48.73	36.73	4
3. Organizing and Motivating faculties to undertake research and development workshops, seminars and conferences	0.00	0.36	11.27	52.36	36.00	2
4. Introduction of specific courses designed to provide industry application of theoretical concepts	0.00	1.45	9.45	53.45	35.64	

Majority of the academicians suggested that there is a need to improve the teaching pedagogy in order to make the lectures interesting and better understanding of the concept. In the above table, out of the total 275 respondents, majority of them strongly agree on conducting conferences, seminar, webinar, workshops, guest lectures and training programs by industry experts for faculties. This will help all the faculties to understand new and upcoming demand of the industries and they can groom the students as per industry demands. 52.36 per cent of the respondents agree in organizing and motivating faculties to undertake research and development workshops, seminars and conferences. This will help the academicians to have an exposure and good networks with other institutes and also come to know different steps taken by other institutes for engineering. 9.45 per cent of the respondents are neutral for introduction of specific courses designed to provide industry applications

of theoretical concepts. They suggested that most of the concepts are theoretical and do not require and practical application, and those with practical experience will be covered during the internship program held at the end of the session. 1.82 per cent of the respondents disagree in conducting faculty development and exchange programs with renowned national and international institutes. Whereas most of them agreed to implement such programs. This is so because some of the academicians think that they had to work as per higher authority guidelines and it is impossible to implement any changes on their ends, while some agreed that we can do as much as possible from our end, remaining will be implemented by others later.

4.4.20 Curriculum should be designed to provide maximum practical exposure to students

Table No. 4. 4.20 Redesigning of curriculum to provide maximum exposure to students

LEVEL OF AGREEMENT	N	%
Strongly Agree	60	21.81
Agree	150	54.55
Neutral	14	5.09
Disagree	31	11.28
Strongly Disagree	20	7.27
Total	**275**	**100.00**

Nowadays the curriculum of students should be designed to provide maximum practical exposure to students. This helps the students to gain employability skills and practical learning as well. In the above table, out of the total 275 respondents 54.55 per cent agree that there is need to redesign the curriculum of the students which includes maximum practical exposure. It will help the students to work with industries more and build a bond as well, which increases the chance of placement. 5.09 per cent of the respondents act neutral in designing change to the curriculum of students as they are satisfied with the practical training, because theoretical understanding is also important. 11.28 per cent of the respondents disagree to implement any changes in the curriculum to provide maximum practical exposure to the students. This is because they think that higher bodies like UGC or AICTE who are designing the curriculum are well versed with the experts and work with special emphasis to students and their future.

4.4.21 Changes that should be made in the Curriculum

Table No. 4.4.21 Changes require in curriculum

LEVEL OF AGREEMENT	N	%
3 years learning+1 year practical	61	22.18
3 years learning+2 years practical	93	33.82
4 years learning+1-year training	121	44.00
Total	**275**	**100.00**

Due to change in technological environment, regular change in the curriculum is also important. Learning of old concept and working on new technology seems to be impossible to run parallel. In the above table, out of the total 275 respondents, 44 per cent recommend to change the curriculum to 4 + 1 where students will attain 4 years of conceptual knowledge and 1 year of practical training which is only 6 months at present. This will be led to increase the overall duration of engineering course from currently 4 years to 5 years. They believe that with the increase in time period of training will help the students in grabbing a good job at the end as they will learn the practical exposure of the concept as well. Companies will also offer them good job opportunities as they are familiar with the students and also reduces their time of conducting placements campaign at different locations. 33.82 per cent of the respondents agreed to replace the curriculum with 3+2 where students will gain 3 years of conceptual knowledge and 2 years of practical training, which also increases the overall duration of engineering program. They emphasized to increase the time period to get trained with the industries and understand what they demand. 22.18 per cent of the respondents focused on 3+1 where students will get 3 years of theoretical learning and 1 year of practical training which do not increase the overall duration of engineering program.

4.4.22 Do you think, government should implement the policy initiatives for reducing the skill mismatch?

Table No. 4.4.22 Opinion on policy initiatives by government to reduce skill mismatch

LEVEL OF AGREEMENT	N	%
Strongly Agree	0	0.00
Agree	98	35.64
Neutral	121	44.00
Disagree	53	19.27
Strongly Disagree	3	1.09
Total	**275**	**100.00**

The countries outside India are more focused on the education of their citizen as compare to India. Most of the policies are framed by the government in order to make full utilization of the skills. In the above table, out of the total 275 respondents 44 per cent of them are neutral that government should implement the policy initiatives for reducing the skill mismatch. It is because they think that government had taken many measures and now students need to improve the skills and attitudes to grab an opportunity for them. 35.64 per cent of the respondents agree that there is still a need by the government to implement the policy initiatives for reducing the skill mismatch. More companies to be setup for the students for placements and updated curriculum are important to be considered. 19.27 per cent of the respondents disagree that government should implement the policy initiatives for reducing the skill mismatch.

4.4.23 According to your opinion lack of easy accessibility of financial assistance is creating a barrier for skilled students to enroll in engineering courses

Table No. 4.4.23 Opinion on lack of accessibility of financial assistance restrict students to get enroll in engineering courses.

LEVEL OF AGREEMENT	N	%
Strongly Agree	100	36.36
Agree	130	47.27
Neutral	9	3.27
Disagree	34	12.36
Strongly Disagree	2	0.73
Total	**275**	**100.00**

As per the data collected from our respondents the major issue is related with the lack of easy accessibility of financial assistance for skilled students to enroll in engineering courses placements of engineers. In the above table, out of the total 275 respondents, majority of them agree with the statement that the lack of easy accessibility of financial assistance is creating a barrier for skilled students to enroll in engineering courses. 36.36 per cent of the respondents strongly agree that there is lack of easy accessibility of financial assistance is creating a barrier for skilled students to enroll in engineering courses. 3.27 per cent of the respondent's responded neutral with the statement.

4.4.24 Measures that should be undertaken for improving the accessibility of financial assistance for the students

Table No. 4.4.24 Measures to undertake for improving the accessibility of financial assistance for students

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Rank
Reducing the rate of education loans	0.73	0.36	4.36	62.55	32.00	1
Encouraging banks, NBFCs and other financial institutions to provide interest free loans for underprivileged students	0.00	0.00	8.36	62.55	29.09	3
Reducing the cost of engineering by setting ceiling for engineering fee (Especially for private colleges)	0.00	0.73	13.45	50.91	34.91	4
Setting up of counselling centres to provide snapshot of the course contents of engineering program to make students familiar with the engineering program.	0.00	3.27	6.18	55.27	35.27	2

In today's scenario, technological advancements are taking place at a greater pace. Students are choosing engineering and looking ahead for a brighter future. Nowadays there are many ways through which students can fulfill their dreams even if they are not economically sound. Education loans, scholarships, fellowships help the students to move the steps ahead. In the above table, out of 275, majority of respondents, strongly agree to reduce the rate of interest on education loans. It is one of the important steps of providing financial assistance to the students by the banks, but if we see the rate of interest it is more than a house loan. Education is the basic necessity and right of every Indian citizen. Then why there is more interest charged for

education than on any other loans? It is believed that education loan must be easily available and at lower interest rate than any other loans. 55.27 per cent of the respondents agree in setting up of counseling centers to provide snapshot of the course contents of engineering programs to make students familiar with the engineering program. Students opting any graduate program do not know the content to be taught prior taking admission in the course. 8.36 per cent of the respondents are neutral in encouraging banks, NBFCs and financial institutions to provide interest free loans for underprivileged students. 0.73 per cent of the respondents disagree to reduce the cost of engineering by setting a ceiling for engineering fee (especially for private colleges). Government institutions do not charge much as engineering fees as compared to private institutions.

4.4.25 Do you think remuneration offered to engineers in India is as per the skills they possess?

Table No. 4.4.25 Remuneration offers to engineers is as per the skills they possess

LEVEL OF AGREEMENT	N	%
Strongly Agree	30	10.90
Agree	50	18.19
Neutral	5	1.82
Disagree	130	47.28
Strongly Disagree	60	21.81
Total	**275**	**100.00**

As per the data collected from our respondents the major problem is related with the placements of engineers. Once they get placed, the regular increment and fair amount had been offered irrespective of government jobs or private. In the above table, out of the total 275 respondents, majority of them disagree with the statement that the remuneration offered to engineers in India is as per the skills they possess. 21.81 per cent of the respondents strongly disagree that there is fair and sufficient categorization in the remuneration offered to an engineer, once he/she got the placement. 1.82 per cent of the respondent's responded neutral with the remuneration offered to engineers in India is as per the skills they possess. 18.19 per cent of the respondents agree that there is fair and sufficient categorization in the remuneration offered to an engineer, once he/she got the placement.

4.4.26 Training could be a viable solution to inculcate requisite skills required by industries in engineering students

Table No. 4.4.26 Training could be a viable solution to inculcate requisite skills required by industries among engineering students

LEVEL OF AGREEMENT	N	%
Strongly Agree	95	34.55
Agree	135	49.09
Neutral	12	4.36
Disagree	18	6.55
Strongly Disagree	15	5.45
Total	**275**	**100.00**

As per the data collected from our respondents, the most of the respondents agreed that training could be a viable solution to inculcate requisite skills required by industries in engineering students. Out of the total 275 respondents, majority of them agree with the statement that the training could be a viable solution to inculcate requisite skills required by industries in engineering students. 5.45 per cent of the respondents strongly disagree that Training could be a viable solution to inculcate requisite skills required by industries in engineering students. 3.27 per cent of the respondent's responded neutral with the statement.

4.4.27 Steps that should be taken to improve training effectiveness

Table No. 4.4. 27 Steps to improve training effectiveness

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Rank
Increase interaction between educational institutes and industries	0.00	0.00	2.18	65.82	32.00	1
Providing interdisciplinary training in order to improve requisite skills in engineering aspirants	0.00	0.73	10.18	54.91	34.18	2
Development of feedback mechanism to review effectiveness of training program	0.00	1.82	10.55	54.18	33.45	5
Development of Industry oriented training programs specifically designed with the help of industry experts	0.00	2.55	8.73	52.73	36.00	3
Establishing Industrial Mentorship programs to drive learning and development for both mentor and mentee	0.73	1.82	10.55	50.91	36.00	4
Establishing industry sponsored training labs and apparatus in educational institutes	0.00	2.91	10.18	54.18	32.73	6
Upgrading the labs/ training apparatus and infrastructure available in educational institutes	0.36	2.18	9.09	58.91	29.45	8
Training should be imparted by expert of that particular field	0.00	5.09	4.36	60.00	30.55	7
Increasing the time duration of training	0.00	0.73	13.45	58.91	26.91	9

There is a need to improve the effectiveness of training for engineering students in order to clear the concepts and understand it by making them practically applicable. In the above table, majority of the respondents agree to increase interaction between educational institutes and industries, in order to understand the industry needs and

fulfill their change in demands as per the technological advancements. 54.91 per cent of the respondents agree to provide interdisciplinary training in order to improve requisite skills in engineering aspirants. This means that if any student wants to know about the other disciplines, such as commerce, or arts, he/she will be given full freedom to choose their own subjects of interest. 52.73 per cent of the respondents in development of industry-oriented training programs specifically designed with the help of industry experts. 50.91 per cent of the respondents agree in establishing industrial mentorship programs to drive learning and development for both mentor and mentee. 54.18 per cent of the respondents agree for the development of feedback mechanism to review effectiveness of training program and establishing industry sponsored training labs and apparatus in educational institutes. 60 per cent of the respondents agree for training should be imparted by expert of that particular field. 58.91 per cent of the respondents agree in upgrading the labs/ training apparatus and infrastructure available in educational institutes and increase the time duration of training.

4.4.28 Consequence of mismatch between demand and supply of requisite skills

Table No. 4.4.28 Consequences of mismatch between demand and supply of requisite skills

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Rank
Decrease in the number of enrolments and closure of engineering institutes	0.00	1.09	2.55	62.55	33.82	1
Decrease in the employability of engineering students	0.73	0.00	8.00	62.91	28.36	4
Deviation of students to other graduate programs and certification courses	0.00	1.45	10.18	52.73	35.64	2
Lack of innovation and creativity	0.00	1.09	12.00	55.64	31.27	6
Lack of investment in education sector	0.00	2.55	12.36	56.00	29.09	8
Increase in recruitment of substandard workforce	0.00	1.82	4.73	62.91	30.55	3
Increase in dependence on Automation and Robotics due to lack of skilled workforce	0.36	1.09	9.45	58.55	30.55	5
Decrease in companies / organizations visiting engineering institutes for placement.	1.45	1.82	8.00	58.91	29.28	7
Increase in social, mental and health care problems	0.36	2.55	9.82	61.45	25.82	9
Increase in suicide attempts	0.00	1.45	13.09	68.36	17.09	10

There are many reasons due to which the gap of demand and supply of the requisite skills by the industry and engineering aspirants is increasing, which lead to many consequences. In the above table, majority of respondents strongly agree to decrease in the number of enrolments and closure of engineering institutes. 52.73 per cent of the respondents agree for deviation of students to other graduate programs and certification courses. 62.91 per cent of the respondents agree to increase the recruitment of substandard workforce and decrease in the employability of engineering students. 58.55 per cent of the respondents agree to increase in dependence on Automation and Robotics due to lack of skilled workforce. 55.64 per cent of the respondents agree that there is lack of innovation and creativity.

4.5 CONCLUSION

This chapter represents survey result of demand and supply of requisite skills among engineering aspirants on question to question. In this present study, Engineering Academicians, Engineering Students and Industrialist/Corporate personnel are taken as respondents. In one section, questions were asked to academicians related to availability of requisite skills like communication skills, technical skills, management and entrepreneurial skills, next generation skills. Some questions were related to their suggestion and opinion to make training system effective, consequences of mismatch between demand and supply of requisite skills. In second section, questions were asked to Industrialist/ corporate personnel regarding their demand for requisite skills among engineering students. Furthermore, their opinion is also taken related to steps and measure to improve the engineering curriculum, training system and education system in india. In third section, questions were asked from engineering students in respect to

existing training programs and its effectiveness. Questions were asked about various type of training programs like summer internship, live projects, industry sponsored training program, in-house training, placement and communication training, entrepreneurship training. Engineering student's opinion was taken regarding training infrastructure, trainers, support from institute and problems in searching jobs etc.

CHAPTER 5

RESULT & DISCUSSION

CHAPTER 5

RESULTS AND DISCUSSION

5.1 INTRODUCTION

This chapter provides the detail applicability of statistical tools in order to test hypothesis framed in order to achieve the research objectives mentioned in research methodology chapter

5.2 RELIABILITY AND VALIDITY OF SCALE

5.2.1 Reliability

Reliability measures whether the data collected is precise or not. It measures how accurate the data is and how accurately the concerned construct is measured. It is the consistency of the estimation, for example degree to which an instrument estimates a similar way each time it is utilized under a similar condition with similar subjects. According to Carmine and Zeller (1979), the tendency toward consistency found in repeated measurements is referred to as reliability.

The reliability of the Questionnaire was evaluated using SPSS software through Cronbach's alpha. The reliability was found .876 which was greater than acceptable value, which indicates data is reliable for study.

Table No. 5.2.1 Reliability Statistics

Cronbach's Alpha	No of Items
.876	40

5.2.2 Validity

Validity is an element which measures whether the researcher is actually measuring what he /she says. Validity is not determined by a single statistic and so face validity, content validity and construct validity were used to check the validity.

Face Validity: If a test appears to be valid to the participants, it is said to have face validity. It is the validity of a test at face value. A test is said to have face validity in the event that it would appear that it is going to measure. All the constructs used in this study were reviewed by senior experts and justified as having good face validity.

Construct validity: Construct validity refers to the extent to which a scale or set of test measures the concept or construct accurately represents the concept of interest (Dillon, Madden, &Firtle, 1994). To measure the construct validity in this study, two most widely accepted forms of construct validity were examined: Item to total correlation and factor analysis. Factor scores of measurement items were considered acceptable if they exceed .5 (Hair et al., 2010).

5.3 STATISTICAL ANALYSIS TO TEST HYPOTHESIS

Regression Analysis

Regression analysis is a reliable method of identifying which variables have impact on a topic of interest. The process of performing a regression allows you to confidently determine which factors matter most, which factors can be ignored, and how these factors influence each other. Multiple regression process creates a regression equation. It shows the effect of independent variables on dependent variables.

5.3.1 1st Objective: - To estimate the number of engineers and requisite skills demanded by industry among aspirants against supply

H01:- Requisite skill demanded by industry is not having positive and significant impact on employability among engineering aspirants.

Table. No. 5.3.1.1 Descriptive Statistics

	Mean	Std. Deviation	N
Employability	6.8100	1.75058	100
Communication skill	22.4900	9.20529	100
Technical skill	18.2600	5.65975	100
Personal attributes skill	35.0400	12.41612	100
Management & Entrepreneurial skill	18.4600	7.48793	100
Next generations kill	27.6300	9.17799	100

Table No. 5.3.1.2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.776[a]	.603	.593	1.48762	.214	8.619	5	94	.000	2.334

a. Predictors: (Constant), next generation skill, management & entrepreneurial skill, communication skill, personal attributes skill, technical skill

b. Dependent Variable: employability

Table No. 5.3.1.3 ANOVA TEST

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	95.368	5	19.074	8.619	.000[b]
	Residual	208.022	94	2.213		
	Total	303.390	99			

a. Dependent Variable: employability

b. Predictors: (Constant), next generation skill, management & entrepreneurial skill, communication skill, personal attributes skill, technical skill

Table No. 5.3.1.4 Coefficients Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.476	.562		16.857	.000
	Communication skill	.108	.055	.570	1.978	.001
	Technical skill	.235	.091	.759	2.588	.011
	Personal attributes skill	.081	.038	.425	2.119	.007
	Management & entrepreneurial skill	.096	.038	.680	2.534	.013
	Next generation skill	.159	.053	.682	3.020	.003

a. Dependent Variable: employability

Regression equation on the basis of above table can be formed as

Y = a + b x + error

Employability = 9.476 +.108 (Communication skill) +.235 (Technical skill) +.081 (Personal attributes skill) +.096 (Management & entrepreneurial skill) +.159 (Next generation skill)

The result of regression analysis shows that the F value is 8.619, which was sig. at 0% level indicating good model fit and value of t is 16.857, which are also significant at 0% level. R square value is .603, which indicates 60.3 % of variance in Employability is explained by **Requisite skill demanded by industries**. These skills are

Communication skill, Technical skill, Personal attributes skill, Management & entrepreneurial skill and Next generation skill **Thus, our null hypothesis is rejected.** This indicates that **Requisite skill demanded by industry is having positive and significant impact on employability among engineering aspirants.**

Table No. 5.3.1.5 Relative Importance of Skills demanded by Industries

Skills demanded by industries	Standardized Coefficients Beta	Relative Importance
Communication skill	**.570**	**4**
Technical Skill	**.759**	**1**
Personal attributes skill	**.425**	**5**
Management & entrepreneurial skill	**.680**	**3**
Next generation skill	**.682**	**2**

The above table indicates the standardized beta coefficients value and order of importance for these dimensions. The results show that the Industries gave first importance to Technical skills in students, Second important skill demanded by industries in students is Next generation skills, Third important skill demanded by industries in students is Management & Entrepreneurial skills, Fourth important skill demanded by industries in students is Communication skills and Fifth important skill demanded by industries in students is Personal attributes skills

5.3.2 2nd Objective: - To identify the available employability skills among engineering aspirants.

H02:- Available employability skills in engineering aspirants are not having positive and significant impact on employment.

Table. No. 5.3.2.1 Descriptive Statistics

	Mean	Std. Deviation	N
employment	8.9302	2.16811	215
communication	19.7209	4.66507	215
Technical skills	18.4140	4.65851	215
Personal attributes skill	44.7395	11.34864	215
Management and Entrepreneurial skill	26.2930	6.59458	215
Next generation skill	20.8791	4.84086	215

Table No. 5.3.2.2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.640[a]	.410	.409	2.01998	.152	7.507	5	209	.000	1.134

a. Predictors: (Constant), next generation skill, communication, personal attributes skill, Technical skills, Management and Entrepreneurial skill

b. Dependent Variable: employment

Table No. 5.3.2.3 ANOVA TEST

Model	Sum of Squares	df	Mean Square	F	Sig.
1Regression	153.164	5	30.633	7.507	.000
Residual	852.789	209	4.080		
Total	1005.953	214			

a. Dependent Variable: employment

b. Predictors: (Constant), next generation skill, communication, personal attributes skill, Technical skills, Management and Entrepreneurial skill

Table No. 5.3.2.4 Coefficients Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.390	.667		14.086	.000
	communication	.220	.057	.672	.828	.009
	Technical skills	.195	.046	.538	2.045	.004
	Personal attributes skill	.235	.065	.782	3.127	.002
	Management and Entrepreneurial skill	.194	.034	.411	1.709	.003
	Next generation skill	.153	.030	.316	1.045	.009

a. Dependent Variable: employment

The equation for regression analysis from table can summarized as below

Y = a + b x + error

Employability 9.390+ .220 (Communication skill) +.195 (Technical skill) + .235 (Personal attributes skill) +.194 (Management & entrepreneurial skill) +.153 (Next generation skill)

The result of regression analysis shows that the F value is 7.507, which was sig. at 0% level indicating good model fit and value of t is 14.086, which are also significant at 0% level. R square value is .410, which indicates 41.0 % of variance in Employability is explained by **available employability skills in students**. These skills are Communication skill, Technical skill, Personal attributes skill, Management & entrepreneurial skill and Next generation skill **Thus, our null hypothesis is rejected.** This indicates that **Available employability skills in engineering aspirants are having positive and significant impact on employment.**

Table No. 5.3.2.5 Relative Importance of employability skills available in students

Skills demanded by industries	Standardized Coefficients Beta	Relative Importance
Communication skill	**.672**	**2**
Technical Skill	**.538**	**3**
Personal attributes skill	**.782**	**1**
Management & entrepreneurial skill	**.411**	**4**
Next generation skill	**.316**	**5**

The above table indicates the standardized beta coefficients value and order of importance for these dimensions. The results show that the most important and first available employability skill at fairly high level is Personal attributes skills in students; Second important skill available in students is Communication skills; Third important skill available in students is Technical skills; Fourth important skill available in students is Management & Entrepreneurial skills and Fifth important skill available in students is Next generation skills.

5.3.3. 3rd Objective: - To study the various factors responsible for mismatch between demands and supply of requisite skills.

Factor Analysis

Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. The Exploratory Factor analysis was performed using Principal Component analysis, with Varimax rotation.

5.3.3.1 KMO and Bartlett's test

KMO test was applied to check the normal distribution of data whereas Bartlett test has been applied to find out whether data is suitable for factor analysis or not.

Table No. 5.3.3.1 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.894
Bartlett's Test of Sphericity	Approx. Chi-Square	16358.068
	df	300
Sig.		.000

KMO is a test conducted to examine the strength of the partial correlation (how the factors explain each other) between the variables. KMO values closer to 1.0 are considered ideal while values less than 0.5 are unacceptable. The KMO value is .894, which is more than 0.5. So this indicates that the degree of information among the variables overlap greatly/the presence of a strong partial correlation. Hence, it is plausible to conduct factor analysis.

The Bartlett's test of Sphericity is used to test the null hypothesis that the correlation matrix is an identity matrix. An identity correlation matrix means your variables are unrelated and not ideal for factor analysis. The result of Bartlett test of chi square is 16358.068 with degree of freedom is 298 and sig. level is .000. This represent that the correlation matrix is indeed not an identity matrix.

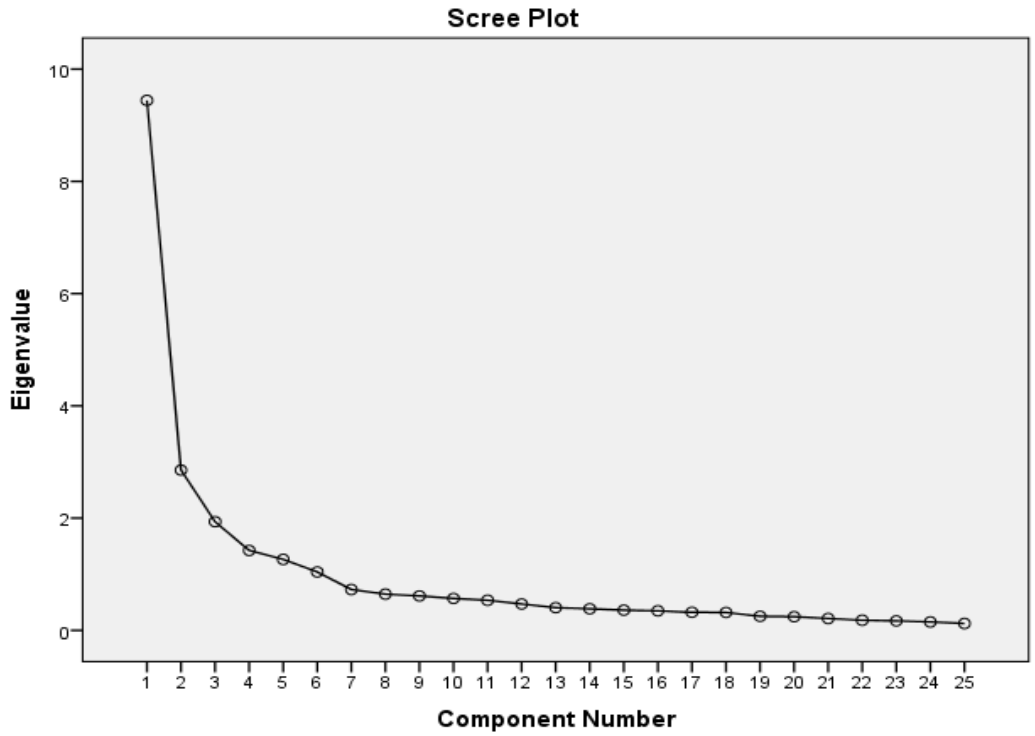
Table No. 5.3.3.2 Total Variances Explained

Factor Name	**Total Eigen Values**	**% of Variance**	**Items Converged**	**Factors Loads**
Inappropriate Training Program	9.433	20.250	Inappropriate training Infrastructure, apparatus, tools, machinery, labs	.881
			Insufficient duration of training	.820
			Lack of well qualified training provider	.756

			Lack of proper information by the industries to students	.709
			Lack of multidisciplinary training programs	.688
			Lack of industry sponsored training labs and apparatus in educational institutes	.656
Lack of Collaboration for Skill Enhancement	3.218	14.276	Increase interaction between educational institutes and industries	.755
			Providing interdisciplinary training in order to improve requisite skills in engineering aspirants	.714
			Development of Industry oriented training programs specifically designed with the help of industry experts	.645
			Establishing Industrial Mentorship programs to drive learning and development for both mentor and mentee	.634
Lack of Innovation & creativity among students	2.856	12.200	Lack of innovation and creativity.	.810
			Introduction of personality development courses in schools	.755
			Entrepreneurship development courses for school students	.685
Inappropriate Teaching Pedagogy methods	1.936	11.742	Increasing the focus on learning through live projects and internships	.791
			Entrepreneurial education and development programs	.796
			Industry participation in designing the curriculum of engineering	.751
Lack of Financial Support	1.425	10.823	Reducing the rate of education loans	.812
			Encouraging banks, NBFCs and other financial institutions to provide interest free loans for underprivileged students	.770
			Reducing the cost of engineering by setting ceiling for engineering fee (Especially for private colleges)	.665
Recruitment and retention of Qualified	1.265	9.794	Recruitment and retention of qualified staff.	.688
			Appropriate teacher-student ratio in class room	.677

teachers			Recruitment of teachers with industry experience	.557
Economic and Global Factor	1.104	8.98+3	Lack of Foreign Direct Investment and Industrial Investment	.849
			Cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living	.816
			Lack of job opportunities	.770
			Slowdown in the economy due to lack of growth and inflation	.725
			Slowdown in the economy due to lack of growth and inflation	.689
			Low expenditure on education sector by Government due to fiscal constraints	.578

Fig No. 5.3.3.1 Screen Plot



Description of factors analysis

Inappropriate Training Program: This factor is having total variances (20.250). Major elements of this factor include inappropriate training Infrastructure, apparatus, tools, machinery, labs, insufficient duration of training, lack of well qualified training provider, lack of proper information by the industries to students, lack of multidisciplinary training program, lack of industry sponsored training labs and apparatus in educational institutes.

Lack of Collaboration for Skill Enhancement: This factor is having total variances (14.276). Major items of this factor constitute Increase interaction between educational institutes and industries, providing interdisciplinary training in order to improve requisite skills in engineering aspirants, development of industry oriented training programs specifically designed with the help of industry experts and establishing industrial mentorship programs to drive learning and development for both mentor and mentee.

Lack of Innovation & creativity among students: This factor is having total variances (12.200). Major elements of this factor include lack of innovation and creativity, introduction of personality development courses in schools and entrepreneurship development courses for school students.

Inappropriate Teaching Pedagogy methods: This factor is having total variances (11.742). Major elements of this factor include Increasing the focus on learning through live projects and internships, entrepreneurial education and development programs and industry participation in designing the curriculum of engineering.

Lack of Financial support from government: This factor is having total variances (10.823). Major elements of this factor include reducing the rate of education loans, Encouraging banks, NBFCs and other financial institutions to provide interest free loans for underprivileged students and Reducing the cost of engineering by setting ceiling for engineering fee (Especially for private colleges).

Recruitment and Retention of qualified teachers: This factor is the most significant factor total variances (8.953). Major elements of this factor include recruitment and retention of qualified staff, appropriate teacher-student ratio in class room and Recruitment of teachers with industry experience.

Economic and Global factors: Major elements of this factor include Lack of Foreign Direct Investment and Industrial Investment, Cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living, Lack of job opportunities, Slowdown in the economy due to lack of growth and inflation and Low expenditure on education sector by Government due to fiscal constraints.

5.3.4 4th Objective: - To study the consequences of mismatch between demand and supply of requisite skills.

5.3.4.1 Consequences of mismatch between demand and supply of requisite skills in view of Academician

Table No. 5.3.4.1. Statistical analysis of consequences of mismatch between demand and supply of requisite skills in view of academicians

Statements	Mean	Std Deviation	Ranking
Decrease in the number of enrollments and closure of engineering institutes	1.540	.5009	9
Decrease in the employability of engineering students	1.630	.4852	8
Deviation of students to other graduate programs and certification courses	1.631	.4853	7
Lack of innovation and creativity	2.440	.9982	2
Lack of investment in education sector	2.442	.9025	1
Increase in recruitment of substandard workforce	2.350	.8919	3
Increase in dependence on Automation and Robotics due to lack of skilled workforce	1.900	.9045	6
Decrease in companies / organizations visiting engineering institutes for placement.	1.990	1.0492	5
Increase in social, mental and health care problems	1.995	.9587	4

There are many reasons due to which the gap of demand and supply of the requisite skills by the industry and engineering aspirants is increasing, which lead to many consequences. In the above table, mean ranking method was applied to know the major consequences of mismatch between demand and supply of requisite skills in view of Academician. Major consequences which is ranked first with mean of 2.442 is Lack of investment in education sector, Lack of innovation and creativity is ranked second with mean of 2.440, Increase in recruitment of substandard workforce is ranked third with mean of 2.350, Increase in social, mental and health care problems

is ranked fourth with mean of 1.995, Decrease in companies / organizations visiting engineering institutes for placement is ranked fifth with mean of 1.990, Increase in dependence on Automation and Robotics due to lack of skilled workforce is ranked sixth with mean of 1.900, Deviation of students to other graduate programs and certification courses is ranked seventh with mean of 1.631, Decrease in the employability of engineering students courses is ranked eighth with mean of 1.630 and Decrease in the number of enrollments and closure of engineering institutes courses is ranked ninth with mean of 1.540

5.3.4.2 Consequence of mismatch between demand and supply of requisite skills in view of Industries

Table No. 5.3.4.2 Statistical analysis of consequences of mismatch between demand and supply of requisite skills in view of industries/ corporate personnel

Statement	Mean	Std. Deviation	Rank
Decrease in the number of enrolments and closure of engineering institutes	2.678	1.09	1
Decrease in the employability of engineering students	1.962	0.00	4
Deviation of students to other graduate programs and certification courses	2.530	1.45	2
Lack of innovation and creativity	1.735	1.09	6
Lack of investment in education sector	1.430	2.55	8
Increase in recruitment of substandard workforce	2.100	1.82	3
Increase in dependence on Automation and Robotics due to lack of skilled workforce	1.890	1.09	5
Decrease in companies / organizations visiting engineering institutes for placement.	1.567	1.82	7
Increase in social, mental and health care problems	1.412	2.55	9
Increase in suicide attempts	1.342	1.45	10

There are many reasons due to which the gap of demand and supply of the requisite skills by the industry and engineering aspirants is increasing, which lead to many consequences. In the above table, mean ranking method was applied to know the major consequences of mismatch between demand and supply of requisite skills in view of Industrialist. Number of enrolments and closure of engineering institutes is major consequences ranked first with mean of 2.638. Deviation of students to other graduate programs and certification courses ranked second with mean of 2.530. Increase the recruitment of substandard workforce ranked third with mean of 2.100. Decrease in the employability of engineering students ranked fourth with mean of 1.962. Increase in dependence on Automation and Robotics due to lack of skilled workforce ranked fifth with mean of 1.890. Lack of innovation and creativity ranked sixth with mean of 1.730. Decrease in companies / organizations visiting engineering institutes for placement ranked seventh with mean of 1.567. Lack of investment in education sector ranked eighth with mean of 1.430. Increase in social, mental and health care problems ranked ninth with mean of 1.412 and Increase in suicide attempts ranked tenth with mean of 1.342.

5.3.5 6th Objective: - Assessing the effectiveness and appropriateness of training imparted to Engineering Aspirants.

H03:- Training programs provided by the institutes & universities are not helpful in getting good placement after completing the engineering course.

Table No. 5.3.5.1 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.766	.586	.585	.8898	1.919

a. Predictors: (Constant), Training Programs
b. Dependent Variable: Placement

Table No. 5.3.5.2 ANOVA TEST

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	58.072	1	58.072	73.351	.000[b]
	Residual	235.928	298	.792		
	Total	294.000	299			

a. Dependent Variable: Placement
b. Predictors: (Constant), Training Programs

Table No. 5.3.5.3 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.889	.161		5.510	.000
	Training Programs	.110	.013	.444	8.564	.000

a. Dependent Variable: Placement

The equation for regression analysis from table can summarized as below

$Y = a + b\ x + error$

Placement = 1.889+.110 (Training programs)

The result of regression analysis shows that the F value is 73.351, which was sig. at 0% level indicating good model fit and value of t is 5.510, which are also significant at 0% level. R square value is .586, which indicates 58.6 % of variance in placement is explained by various training provided to students. **Thus, our null hypothesis is rejected.** This indicates that **training programs provided by the institutes & universities are helpful in getting good placement after completing the engineering course.**

5.4 CONCLUSION

This chapter focused on testing of hypothesis in order to achieve research objectives. For the accomplishment of first objective regarding desirable requisite skills and its impact on employability skills was achieved through applying regression analysis and data revealed that requisite skill demanded by industry is having positive and significant impact on employability among engineering aspirants. Furthermore, data also exposed that Industries gave first importance to Technical skills in students, Second important skill demanded by industries in students is Next generation skills, Third important skill demanded by industries in students is Management & Entrepreneurial skills, Fourth important skill demanded by industries in students is Communication skills and Fifth important skill demanded by industries in students is Personal attributes skills**.** In order to accomplish second objective about availability of requisite skills among engineering aspirants was achieved through using descriptive statistics, regression analysis and coefficients. Statistical data shown that the most important and first available employability skill at fairly high level is Personal attributes skills in students; Second important skill available in students is Communication skills; Third important skill available in students is

Technical skills; Fourth important skill available in students is Management & Entrepreneurial skills and Fifth important skill available in students is Next generation skills which have positive and significant impact on employment. The third objective was regarding factors affecting mismatch between demand and supply of requisite skills among engineering aspirants which was achieved through applying factor analysis and value of factor loading defined that inappropriate training program, lack of collaboration for skill enhancement, lack of innovation and creativity among students, lack of financial support from government, recruitment and retention of qualified teachers, economic and global factors and inappropriate teaching pedagogy methods are the main factors responsible for the mismatch. The fourth objective was about consequences of mismatch between demand and supply of requisite skills in view of industries and academicians. Through calculating mean ranking, data reveals that according to academicians, lack of investment in education sector, lack of innovation and creativity, increase in recruitment of substandard workforce are top three consequences and from industrialists point of view number of enrolments and closure of engineering institutes, deviation of students to other graduate programs and certification courses and increase the recruitment of substandard workforce are the top three consequences of mismatch. The last objective was related with training effectiveness and appropriateness imparted to engineering aspirants. Descriptive statistics and regression analysis was applied to test hypothesis and data shown that Training programs provided by the institutes & universities are helpful in getting good placement after completing the engineering course.

CHAPTER 6

FINDINGS & RECOMMENDATION

CHAPTER-6

FINDINGS AND RECOMMENDATION

6.1 MAJOR FINDINGS OF THE STUDY

1. Finding of Students

Result shows that out of total 300 respondents 35.3 per cent of students says that institute provides Summer internship, live projects and industry sponsored training program, According to 35 per cent of students institute provides Placement support and communication skills training, 19 per cent of students says that institute provides In-house training program/ Classroom training and according to 10.7 per cent of students institute provides Managerial and entrepreneurial development training. The majority of institute provides summer internship, live projects and industry sponsored training program because these type of training provides practical knowledge and develop analytical skills among students.

Result shows that students agreed that summer internship, live projects and industry sponsored training programs was able to achieve the objective it was meant for. According to students these training program enhance employability skills. 64 per cent of the respondents thinks that summer internship, live projects and industry sponsored training programs is well executed and well planned. According to students these training program able to provide knowledge and understanding of subject, students agreed these training program able to provide practical experience of theoretical concepts and according to students summer internship, live projects and industry sponsored training programs was effective and informative.

Result shows that students agreed that Placement Support and Communication Skill Training Program were able to achieve the objective it was meant for. According to 76.7 per cent of the students these training program enhance employability skills. 78.8 per cent of the respondents think that Placement Support and Communication Skill Training programs is well executed and well planned. According to 74.7 per cent of the students these training program able to provide knowledge and understanding of subject, students agreed these training program able to provide practical experience of theoretical concepts and according to 73 per cent of the students Placement Support and Communication Skill Training programs was effective and informative.

Result shows that 80.6 % of students agreed that trainers created an atmosphere of continuous learning. 75.6 percent of the respondents agreed that trainers provide feedback at the end of training program, 80.0 percent of the respondents agreed that training providers are able to establish and maintain good relationship with trainee, 78.0 percent of the respondents agreed that training providers was an expert of his field and 74.0 percent of the respondents agreed that training providers was interactive during the training program.

According to 55.3 percent of students it is essential to reduce the rate of education loan. 39.3 percent of the respondents agreed that it is essential that institute must provide Interest free education loans for underprivileged students, 46.3 percent of the respondents agreed that it is essential to reduce the cost of engineering by setting ceiling for engineering fee, 47.0 percent of the respondents agreed that it is essential to Provide funds to engineering students for student exchange programmes, 47.7 percent of the respondents agreed that it is essential to have students interaction with industry experts to provide insight about the engineering program, 50.3 percent of the respondents agreed that setting up of counselling centers at school level to provide

snapshot of the course contents of engineering program to make students familiar with the engineering program is essential for engineering program.

According to 49.0 percent of students it is essential to have proper internet facilities in campus. 47.3 percent of the respondents agreed that it is essential that institute must provide equipment in laboratories, 43.7 percent of the respondents agreed that library is essential in institute, 47.7 percent of the respondents agreed that well equipped and latest technology based computer labs are essential in institute, 40.7 percent of the respondents agreed that E-Learning resources is essential in institute, 45.0 percent of the respondents agreed that incubation center is essential in institute, 52.0 percent of the respondents agreed that active entrepreneurship cell is essential in institute. These all facilities will help in overall development of the engineering institute and helps in campus placement of students.

Result shows that 48.0 percent of student faced problem like finding the right company to apply to a great extent. 41.3 percent of the respondents faced problem like clearing interview to a great extent, 40.7 percent of the respondents faced problem like difficulty in clearing written test to a great extent, 45.7 percent of the respondents faced problem like clearing group discussion to a great extent, 46.0 percent of the respondents faced problem like Appropriate remuneration offered by the company to a great extent and 43.7 percent of the respondents faced problem like insufficient ability and skill set as per the requirements of industry.

2. Findings of corporate/ industrial personnel

Result shows that 33.0 per cent of the respondents think that the Basic written communication skills (English) should be desirable in students. 31.0 per cent of the respondents think that the Basic verbal communication skills (English) should be

desirable in students 43.0 per cent are in favour of active listening skills, which means the students who is looking for job in industries must be active listeners and understand what is delivered to them. 39.0 per cent of the respondents acknowledge that the group discussion skill should be desirable in students. 21.0 per cent of the respondents think that the presentation skills should be desirable in students. 42.0 per cent of the respondents acknowledge that the team communication skills should be desirable in engineering graduates so they can present the work in effective manner so as to be understood by others. 25.0 per cent of the respondents acknowledge that the formal communication skills should be desirable in engineering graduates. 36.0 per cent of the respondents think that the ability to communicate in multiple languages should be desirable in students.

Out of the total respondents 49.0 per cent suggested that basic numeracy and computational skills is desirable for students. 47.0 per cent of the respondents think that engineering students should possess database analysis and management skills. 36.0 per cent of the respondents suggested that basic fundamental knowledge of mathematics, science and engineering is desirable for students. 29.0 per cent of the respondents suggested that engineering students should possess ability to design a system, component, or process to meet desired needs. 38.0 per cent of the respondents suggested that engineering students should possess ability to identify, formulate, and solve engineering problems. 41.0 per cent of the respondents suggested that engineering students should possess ability to apply knowledge of mathematics, science and engineering practically. 39.0 per cent of the respondents suggested that engineering students should possess in-depth technical competence in a specific engineering discipline.

Nowadays the organization not only needs a technical aspirant to design software but also possess some self-managerial and interpersonal skills as well. Out of the total respondents 45.0 per cent suggested that self-discipline is desirable for students. 42.0 per cent of the respondents think that engineering students should possess self-awareness skills. 36.0 per cent of the respondents think that engineering students should possess self-motivation skills. 38.0 per cent of the respondents suggested that positive attitude is desirable for students. 43.0 per cent of the respondents suggested that engineering students should possess ability to withstand in difficult situations. 45.0 per cent of the respondents suggested that engineering students should possess conflict negotiation and resolution skills. 50.0 per cent of the respondents suggested that engineering students should be being flexible as and when the situation demands. 38.0 per cent of the respondents suggested that engineering students should possess ability to take initiatives. 29.0 per cent of the respondents suggested that engineering students should possess ability to work under pressure. 40.0 per cent of the respondents suggested that engineering students should possess effective time management skills. 43.0 per cent of the respondents suggested that engineering students should possess effective leadership skills. 35.0 per cent of the respondents suggested that engineering students should possess ability to work in teams. 40.0 per cent of the respondents suggested that ability to have an understanding of ethical responsibilities and their commitments towards them is desirable for students. 40.0 per cent of the respondents suggested that ability to accept professional responsibility and commitments is desirable for students. 41.0 per cent of the respondents suggested that social and intercultural adaptability is desirable for students.

Out of the total respondents 40.0 per cent suggested that courage and risk-taking ability is desirable for students. 41.0 per cent of the respondents think that engineering

students should possess critical thinking skills. 45.0 per cent of the respondents think that engineering students should possess effective Decision-making skills. 47.0 per cent of the respondents suggested that curiosity is desirable for students. 38.0 per cent of the respondents suggested that engineering students should possess creativity and innovation. 31.0 per cent of the respondents suggested that engineering students should possess marketing of Concept/ Idea/ Product/ Service. 41.0 per cent of the respondents suggested that engineering students should have project management skills. 43.0 per cent of the respondents suggested that engineering students should possess budget allocation and planning abilities. 35.0 per cent of the respondents suggested that engineering students should possess task delegation skills. 42.0 per cent of the respondents suggested that engineering students should possess organization management skills. 35.0 per cent of the respondents suggested that engineering students should possess Ability to evaluate and review performance. 40.0 per cent of the respondents suggested that engineering students should possess Ability to influence and persuade in order to achieve goals and objective.

In order to make a college education more effective, there should be updation of course curriculum by industry person and institutes & universities should focus on Entrepreneurial education and development programs. In the above table, out of the total respondents, 52.0 per cent agree that there should be industry participation in designing the curriculum of engineering. 46.0 per cent strongly agree that there should be workshops, seminars, conferences and guest lectures by industry experts. 40.0 per cent of the respondents strongly agree that colleges should increase the focus on learning through live projects and internships. 32 per cent of the respondents strongly agreed that colleges should focus on entrepreneurial education and development programs to make college education more effective. 40.0 per cent of the respondents

strongly agree that there should be faculty development and exchange programs for engineering faculties to enhance the knowledge of teachers. 32.0 per cent of the respondents strongly agree that institution should focus on industry sponsored labs and training centers in educational institutes. 20.0 per cent of the respondents strongly agree that institution should focus on industry sponsored incubation centers. 23.0 per cent of the respondents strongly agree that institution should motivate faculties to undertake research and development workshops, seminars and conferences.

Employment generation is the important indicator of economic development so government should take initiatives for reducing the skill gap. Out of the total respondents, 40.0 per cent agreed that government should increase the collaboration between industries and educational institutes through various modes such as public private partnerships and special purpose vehicles. 38.0 per cent strongly agreed that skill gap can be reduced by developing government sponsored skill development labs for engineering students. 42.0 per cent of the respondents strongly agree that government should provide funds to encourage the institutions and students to develop innovative and practical projects. 43 per cent of the respondents agreed for creation of industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects. 40.0 per cent of the respondents agree that creation of incubation centers keeping in view local industry ecosystem requirements will reduce the skill gap.

Out of the total respondents, 42.0 per cent agreed that Lack of foreign direct investment and industrial Investment is an economic factor which is responsible for skill mismatch in Madhya Pradesh. 32.0 per cent agreed that cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living is another factor which is responsible for skill mismatch in Madhya

Pradesh. 38.0 per cent of the respondents strongly agreed that lack of job opportunities is an important factor for skill mismatch in Madhya Pradesh. 43 per cent of the respondents agreed that slowdown in the economy due to lack of growth and inflation is an economic factor which is responsible for skill mismatch in Madhya Pradesh. 46.0 per cent of the respondents agreed that low expenditure on education sector by Government due to fiscal constraints is another economic factor which is responsible for skill mismatch in Madhya Pradesh.

Out of the total respondents, 48.0 per cent agreed that government should reduce the cost of establishing industries in Madhya Pradesh to attract more industries for economic development. 44.0 per cent agreed that government should reduce the cost of transportation for industries to attract more industries for economic development. 41.0 per cent of the respondents agreed that reducing the cost of electricity and fuel for industries helps government to attract more industries for investment. 35.0 per cent of the respondents agreed that government should reduce the rate of taxes for industries to attract more industries for economic development. 44.0 per cent of the respondents agree that reducing red tapism and number of permissions required for setting up of industries helps government to attract more industries for investment.

On the question of consequence of mismatch, majority of respondents strongly agreed that decrease in the number of enrolments and closure of engineering institutes, is the major consequence of mismatch. 32.0 per cent of the respondents agree for Decrease in the employability of engineering students is the another consequence. 33.0 per cent of the respondents agree for deviation of students to other graduate programs and certification courses is the part of consequence. 34.0 per cent of the respondents agreed to lack of innovation and creativity. 42.0 per cent of the respondents agreed to lack of investment in education sector 36.0 per cent of the respondents agreed to

increase the recruitment of substandard workforce. 25.0 per cent of the respondents agreed to increase in dependence on automation and robotics due to lack of skilled workforce. 35.0 per cent of the respondents agreed to decrease in companies / organizations visiting engineering institutes for placement. 33.0 per cent of the respondents agree to Increase i social, mental and health care problems is the consequence of mismatch.

Engineering institute should provide effective training program in order to provide engineering workforce tailor made for industries. Out of the total respondents, 45.0 per cent agreed that there must be increase interaction between educational institutes and industries. 41.0 per cent strongly agreed that institute should provide interdisciplinary training in order to improve requisite skills in engineering aspirants. 41.0 per cent of the respondents agreed that institute must develop feedback mechanism to review effectiveness of training program. 35 per cent of the respondents agreed for development of industry oriented training programs specifically designed with the help of industry experts. 42.0 per cent of the respondents agreed for establishing industrial mentorship programs to drive learning and development for both mentor and mentee. 46.0 per cent of the respondents agree for establishing industry sponsored training labs and apparatus in educational institutes. 44.0 per cent of the respondents agreed that training should be provided by expert of that particular field. 41.0 per cent of the respondents agree for increasing the time duration of training.

3. Findings of Academicians

Result depicted that nearby 61.82 per cent of the respondents thinks that the students possess an effective pronunciation skill at an average level. 61.09 per cent are in

favour of active listening skills at average level, which means the students are active listeners and understand what is delivered to them. 62.55 per cent of the respondents acknowledge the group discussion skill in the students at an average level. This means the discussion on a topic helps them to understand it and grab the information attained from others. 59.64 per cent of the respondents picked up the basic verbal communication (English) skill at an average level, means the students can understand English language, and speak the basic. 58.18 per cent of the respondents agrees on the presentation skill at an average level. The engineering graduates can present the work in effective manner so as to be understood by others.

Result shows that the students possess the ability to design a system, component, or process to meet desired needs at an average level responded by 64.36 per cent of the academicians. Out of the total respondents 54.55 per cent suggested that an in-depth technical competence in a specific engineering discipline at an average level. 59.64 per cent of the respondents thinks that engineering students possess database analysis and management skills at an average level. 62.55 per cent of the respondents opted that students are enabled with the basic fundamental knowledge of mathematics, science and engineering. 54.91 per cent of the respondents acknowledged the ability to apply knowledge of mathematics, science and engineering practically. The engineering students possess the ability to identify, formulate and solve engineering problems at an average level, is given by 52.73 per cent of the respondents. 51.64 per cent of the respondents thinks that the engineering students possess the basic numeracy and computational skills at an average skill.

Result shows that 58.91 per cent of the respondents think that students possess social and intercultural adaptability skills at an average level. 63.64 per cent of the respondents own self-motivation, ability to understand, acknowledge and value other

cultures and diversity skills at an average level. 57.45 per cent of the respondents thinks that engineering graduates possess an ability to work in teams at an average level.

At the time of data collection, we come to know that engineering graduates lack in entrepreneurial and management skills as per academicians. After analysing the data collected through questionnaire, 64 per cent of the respondents think that engineering graduates possess effective decision-making and curiosity skills at an average level. 58.18 per cent of the respondents acknowledged that marketing of concept/idea/product service and project management skills at an average level. 66.91 per cent of the respondents suggested that students of engineering possess critical thinking and creativity and innovation skills at an average level. 58.55 per cent of the respondents thinks that students possess budget allocation and planning abilities at an average level. 55.64 per cent of the respondents suggested that students possess courage and risk-taking ability skills at an average level.

According to 64 per cent respondents, the students possess cyber security and analytics skills at an average level. 66.91 per cent of the respondents think that engineering graduates possess data warehousing and data mining skills at an average level. Out of the total respondents, 58.55 per cent of them suggested that engineering students possess knowledge about automation and artificial intelligence skills at an average level. 60.73 per cent of the respondents think that students possess machine learning skills at an average level. Out of the total respondents 58.18 per cent suggested that graduates completing engineering possess knowledge about cloud-based computing skills at an average level. 60 per cent of the respondents think that students possess robotic as next generation skill at an average level. 57.09 per cent of the respondents suggested that students have knowledge about internet of things

(IOT) at an average level. 55.64 per cent of the respondents acknowledged that students in engineering have big data analysis skills at an average level.

The academicians from different institutes focused on the fact that unavailability of skills is hampering the growth of the engineering graduates. Out of the total respondents 50.55 per cent strongly agreed on the point that unavailability of the requisite skills is one of the major reasons for high unemployment in engineering field. 46.55 per cent of the respondents agree that requisite skills are lacking amongst engineering graduates and it is one of the major reasons for high unemployment. 2.18 per cent are neutral and neither they agree or disagree on the unavailability of the requisite skills as one of the reasons of unemployment in engineering field. 0.73 per cent of the respondents disagree that skills are one of the reasons for high unemployment in engineering field.

Apart from employability skills the engineering graduates need to nurture the basic education possess in the school. The academicians suggested that school education is very basic and important, as it helps to develop the personality of the student. The skills that are needed for the placement is developed from the basic education. The institutes add on some skills necessary in the market into the skills they already possess at the time of school. Out of the total 275 respondents 55.27 per cent agree that there is a need to restructure the governing body of school education in order to make it more relevant for the dynamic needs and challenges in education field. 33.82 per cent of the respondents strongly agreed that need to restructure the governing body of school education in order to make it more relevant for the dynamic needs and challenges in education field. 9.45 per cent of the respondents are neutral and neither agree nor disagree that there is a need to restructure the governing body of school

education in order to make it more relevant for the dynamic needs and challenges in education field.

In order to make a career ahead, the basic education needs to be strong. Out of the total respondents, 35.27 per cent strongly agree that at the time of school education learning through practical projects, workshops, case studies and seminars will make the students to have a better understanding of the concepts. 30.91 per cent of the respondents strongly agree that students must introduce with the personality development courses so that they get an ideas to improve themselves and understand to react in different situations. 28 per cent of the respondents strongly agreed to have an understanding of entrepreneurship development courses in schools, which will help them to innovate some new ideas by their own and do not depend on placements only. 27.27 per cent of the respondents strongly agreed that students must be taught with the help of debates and presentation so that they will get the clearance of the concept as well as remove of all the doubts they build up in their minds but unable to ask due to some reason. 31.27 per cent of the respondents strongly agreed that there must be appropriate student-teacher ratio in classroom. Excess of students under the guidance of one teacher will not be handled properly and less students with more teachers will create a confusion. 28.36 per cent of the respondents strongly agreed that there must be effective quality of teaching and learning infrastructure for the students. This will help the students to increase their interest in learning and being regular. 25.82 per cent of the respondents strongly agreed that there is the need of periodic updating of the curriculum which will make the students remain updated with the new techniques and inventions.

At the time of data collection, the academicians suggested that some students do not opt engineering as their own career choice but influenced from other relatives, family

pressure or friends. So, it is important to suggest and guide them to make a career of their choice and not influenced from others. Out of the total 275 respondents, 58.91 per cent strongly agreed that there is a need of career guidance centres for the students at school level. 37.45 per cent respondents agreed that students must be guided at school level for choosing the right career of their interest. 3.27 per cent respondents are neutral and they neither agree nor disagree on establishing career guidance centres for the students at school level. 0.36 per cent of the respondents also disagree that there is no need for career guidance centres for students at school level, as they can discuss with their parents, relatives and others.

Majority of the academicians suggested that there is a need to improve the teaching pedagogy in order to make the lectures interesting and better understanding of the concept. Out of the total 275 respondents, majority of them strongly agreed on conducting conferences, seminar, webinar, workshops, guest lectures and training programs by industry experts for faculties. This will help all the faculties to understand new and upcoming demands of the industry and they can groom the students as per industry demands. 52.36 per cent of the respondents agreed in organizing and motivating faculties to undertake research and development workshops, seminars and conferences. This will help the academicians to have an exposure and good networks with other institutes and also come to know different steps taken by other institutes for engineering. 9.45 per cent of the respondents are neutral for introduction of specific courses designed to provide industry applications of theoretical concepts. They suggested that most of the concepts are theoretical and do not require and practical application, and those with practical experience will be covered during the internship program held at the end of the session. 1.82 per cent of the respondents disagree in conducting faculty development and exchange programs

with renowned national and international institutes. Whereas most of them agreed to implement such programs. This is because some of the academicians think that they had to work as per higher authority guidelines and it is impossible to implement any changes on their ends, while some agreed that we can do as much as possible from our end, remaining will be implemented by others later.

Out of the total 275 respondents 54.55 per cent agree that there is need to redesign the curriculum of the students which includes maximum practical exposure. It will help the students to work with industries more and build a bond as well, which increases the chance of placement. Many organizations do not provide better learning during the training because the duration is very less, due to which they do not want to waste time and efforts on one student. Secondly industries at the time of internship cannot judge the qualities and skills of the students in less expenditure of time. 34.18 per cent of the respondents acts neutral in designing change to the curriculum of students as they are satisfied with the practical training, because theoretical understanding is also important. 11.27 per cent of the respondents disagree to implement any changes in the curriculum to provide maximum practical exposure to the students. This is because they think that higher bodies like UGC or AICTE who are designing the curriculum are well versed with the experts and work with special emphasis to students and their future.

The countries outside India are more focused on the education of their citizen as compare to India. Most of the policies are framed by the government in order to make full utilization of the skills. Out of the total 275 respondents 44 per cent of them are neutral that government should implement the policy initiatives for reducing the skill mismatch. It is because they think that government had taken many measures and now students need to improve the skills and attitudes to grab an opportunity for them.

35.64 per cent of the respondents agreed that there is still a need by the government to implement the policy initiatives for reducing the skill mismatch. More companies to be setup for the students for placements and updated curriculum are important to be considered. 19.27 per cent of the respondents disagree that government should implement the policy initiatives for reducing the skill mismatch.

In today's scenario, technological advancements are taking place at a greater pace. Students are choosing engineering and looking ahead for a brighter future. Nowadays there are many ways through which students can fulfil their dreams even if they are not economically sound. Education loans, scholarships, fellowships help the students to move the steps ahead. Out of 275, majority of respondents, strongly agree to reduce the rate of interest on education loans. It is one of the important steps of providing financial assistance to the students by the banks, but if we see the rate of interest it is more than a house loan. Education is the basic necessity and right of every Indian citizen. Then why there is more interest charged for education than on any other loans? It is believed that education loan must be easily available and at lower interest rate than any other loans. 55.27 per cent of the respondents agreed in setting up of counselling centres to provide snapshot of the course contents of engineering programs to make students familiar with the engineering program. Students opting any graduate program do not know the content to be taught prior taking admission in the course. 8.36 per cent of the respondents are neutral in encouraging banks, NBFCs and financial institutions to provide interest free loans for underprivileged students. 0.73 per cent of the respondents disagree to reduce the cost of engineering by setting a ceiling for engineering fee (especially for private colleges). Government institutions does not charge high engineering fees as compared to private institutions.

As per the data collected from our respondents the major problem is related with the placements of engineers. Once they get placed, the regular increment and fair amount had been offered irrespective of government jobs or private. Out of the total 275 respondents, majority of them agreed with the statement that the remuneration offered to engineers in India is as per the skills they possess. Sometimes if a person is holding an average level of skills, or some jobs which do not require any other skills except the technical knowledge is also offered fair amount. 48 per cent of the respondents strongly agreed that there is fair and sufficient categorization in the remuneration offered to an engineer, once he/she got the placement. 1.82 per cent of the respondent's responded neutral with the remuneration offered to engineers in India is as per the skills they possess.

There is a need to improve the teaching pedagogy for engineering students in order to clear the concepts and understand it by making them practically applicable. Majority of the respondents agreed to increase interaction between educational institutes and industries, in order to understand the industry needs and fulfil their change in demands as per the technological advancements. 54.91 per cent of the respondents agreed to provide interdisciplinary training in order to improve requisite skills in engineering aspirants. This means that if any student wants to know about the other disciplines, such as commerce, or arts, he/she will be given full freedom to choose their own subjects of interest. 52.73 per cent of the respondents agreed on development of industry-oriented training programs specifically designed with the help of industry experts. 50.91 per cent of the respondents agreed in establishing industrial mentorship programs to drive learning and development for both mentor and mentee. 54.18 per cent of the respondents agreed for the development of feedback mechanism to review effectiveness of training program and establishing industry

sponsored training labs and apparatus in educational institutes. 60 per cent of the respondents agree for training should be imparted by expert of that particular field. 58.91 per cent of the respondents agreed in upgrading the labs/ training apparatus and infrastructure available in educational institutes and increase the time duration of training.

There are many reasons due to which the gap of demand and supply of the requisite skills by the industry and engineering aspirants is increasing, which leads to many consequences. Majority of respondents strongly agreed to decrease in the number of enrolments and closure of engineering institutes. 52.73 per cent of the respondents agreed for deviation of students to other graduate programs and certification courses. 62.91 per cent of the respondents agree to increase the recruitment of substandard workforce and decrease in the employability of engineering students. 58.55 per cent of the respondents agreed to increase in dependence on automation and robotics due to lack of skilled workforce. 55.64 per cent of the respondents agreed that there is lack of innovation and creativity.

6.2 RECOMMENDATION

Human resource, in terms of quality and quantity, is the India's biggest assets. A favourable demographic structure (with about 50 percent of the population below 25 years of age) adds to this advantage. However, to capitalize fully on this opportunity and not face the possibility of a skills-shortage, it is essential to gear up the education system through innovative initiatives. The two greatest concerns of employers today are finding good workers and train them. The difference between the skills needed on the job and those possessed by applicants, sometimes called the skills-gap, which is the real concern to HR managers and business owners to hire competent employees.

Employers would prefer to hire people who are trained and ready to go to work & they are usually not willing to provide the specialized, job-specific training necessary for those who are lacking with skills. Finding workers who have employability or job readiness skills to fit into and remain in the work environment is a real problem. The term employability signals a connection to the world of work that is dynamic and long-term in nature.

In the wake of rapid growth in higher education and increased competition, graduates are forced to equip themselves with more than just the academic skills. However, the resulting quality of the engineering graduates does not fully satisfy the requirements of the global market. Self-financing private engineering colleges are churning out most of the engineering graduates in the country. But the quality is questionable. Graduates have educational eligibility but lack in capability and suitability to execute job related activities despite the availability of employment opportunities.

There is a complete mismatch between the knowledge gained by the students in engineering colleges and current practice in the field. Industry often finds engineering graduates' weak in professional practice thus necessitate the long duration on the job training for to for making them professionally useful. Emphasis has shifted from learning and acquiring skills to passing the examination. This has resulted in an overemphasis on theory at the cost of practice. So, on the basis of the findings of the study and subsequent conclusions, following are some of the recommendations for the Industry as well as Institute and some suggestions for the further research in this area.

1. In order to reduce the gap between demand and supply of requisite skills among engineering aspirants, there is a need to start improving the school education system. The fundamental knowledge needs to be strong and able to build a

personality ready to choose the career of his/her choice. The students must be able to have clear conceptual knowledge as well as the updated acquaintance of the technology and concepts. In the developed countries like Germany, the school education system is designed as per the abilities and skills of the children. After 4^{th} class the students need to send in 3 categories as: Gymnasium, real Schule, and Hauptschule. After class 10^{th} vocational training is given to the students who all are interested in opting for the career besides studying. In other words, the child after 4^{th} class can go in either of the categories mentioned above, in which students who like studying further will opt for gymnasium, who wants to pursue career besides studying or students who are not interested in studying further can opt for realschule and Hauptschule. Under these options practical training has been focused by an internship and one can earn as well with the studies. Overall positive aspect of this education system is children will choose what they like and not influence by others. Secondly students studying from economically weaker sections of the society, will help their family as well as can continue their studies. In Germany carpenter, plumber and other small but essential people are treated and paid on the same grounds as an Engineer. In India every student is running to become a doctor, engineer, or any high-level jobs. For this sometimes he/she need to sacrifice their actual passion and interest. The removal of levels from society at the school education for any kind of job can help students achieve what actually the child wants.

2. In the countries like Singapore, students will learn from 1^{st} to 6^{th} in primary school. After 6^{th}, students have to appear for a primary school leaving exam (PSLE). The results of this exam will categories the students as Express team, normal academic and normal technical from grade 7. The students with excellent

learning skills and interest in studies will be categorized in express teams, whereas those in other curricular activities will be categorized in normal academic and normal technician. After grade 10 the students can upgrade themselves from normal academic or normal technician to express teams based on the scores, they possess in O level exam.

3. In the countries like Singapore, Germany, Finland, education system is being built as a backbone of the country. More than 20 per cent of the GDP is being utilised for education sector. Compulsory education is being made for every citizen of their country, and every student after completing grade 12^{th} need to serve their country for 2 years by joining defence, army, or navy. As a result, it will make the citizens ready to fight at the time of war with other countries as well as create a sense of belongingness towards their own country. The jobs like carpenter, plumber, driver, sweeper, peon etc are treated low in our country, but in above countries each and every job has equal distribution of remuneration as well as status in the society as an engineer, doctor etc. and also provide training for the same.

4. Some of the students pursuing engineering, need to choose the career option just because he/she wants to become an IAS/IPS officer. Past researches have shown the fact that nearby 80 percent of the UPSC aspirants who qualified the exam, are Engineers. Educational institutes like Vinayaka Mission, IIBS mostly situated in south region of India has started the courses with UPSC preparation as well. This means any student who wants to pursue graduation in any field not specifically engineering can opt for UPSC preparations as well. For ex- B.A+IAS, BBA+IAS, B. Sc+ IAS, B. Tech+ IAS and so on. This will help the crowd (not interested in engineering) to choose for different options as well.

5. Nowadays the institutions are not only providing the placements but also promoting the entrepreneurial activities. The institutes running in south India are helping the students who wants to start their own business as an option after graduation. The students will get the help of finance and space for start-ups sponsored by the institutions for the innovative ideas. This will increase the sense of creativity and generate new ideas in the society apart from taking just the jobs.

6. In Europeans countries, bologna process was started, in which the government will implement and suggest time to time changes in the educational policy to overcome the obstacles to create a European higher education area.

7. Another was bloom taxonomy, published in 1956 by a team of cognitive psychologists at the university of Chicago. This system used to define and distinguish different levels of human as cognition (i.e. thinking), learning and understanding. Educators typically used bloom's taxonomy to inform or guide the development of assessments (tests, and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.

8. Program learning outcome (PLO) are considered necessary for students to pursue their studies at a higher level. PLO is a description of the knowledge, competencies and values a student displays at the end of the program. PLO help the students understand why this knowledge and these competencies will be useful to them. They highlight the context and potential application of knowledge and competencies, help students to connect their learning to various situations and guide the selection of evaluation methods. Program learning outcome show how students can make use of the material and content both inside and outside.

9. Course learning outcome are statements clearly describing the meaningful, observable and measurable knowledge skills and dispositions students will learn in this course. CLO clearly identify what the student will know and able to do after successfully completing this course- the essential knowledge, abilities and attitudes that constitute the basic learning needed by a graduate of this course. There are three types of CLO:

    a) Cognitive outcomes- what will students completing this course will know?

    b) Behavioural outcomes- what will students completing this course be able to do?

    c) Affective outcomes- what will students completing this course care about or think?

10. Subject learning outcome (SLO) identify what your students will know and be able to do upon successful completion of your subject. It is recommended to develop between 3 to 5 SLOs per subject.

11. ECTS is a tool of European higher education area for making studies and courses more transparent. It helps students to move between countries and to have their academic qualifications and study periods abroad recognized. ECTS allows credits taken at one higher education, need to be counted towards a qualification studied for at another. It enhances the flexibility of study programmes for students and also supports the planning, delivery and evaluation of higher education programmes. It is a central tool in the bologna process, which aims to make national education system more comparable globally. It also helps to make the

documents such as diploma supplement, clear and easier to use in different countries.

12. Washington Accord was signed in 1989, is a multi-lateral agreement between bodies responsible for accreditation or recognition of tertiary level engineering qualification within their jurisdictions who have chosen to work collectively to assist the mobility of professional engineers. The accord acknowledges that accreditation of engineering academic programmes is a key foundation for the practice of engineering at the professional level in each of the countries or territories covered by the accord. The accord outlines the mutual recognition between the participating bodies, of accredited engineering degree programs. It also establishes benchmark for professional engineering education across those bodies. Currently, there are 20 signatories that make up the Washington accord. There are also 8 organization who held provisional signatory status.

13. Indian Universities and other research institutes have realized that their role should be changed and modified according to the changing trends of the globalized economy. Also they should consider that they should not only provide local area/industries with graduates but they should find themselves competing on a global scale for students. In turn, they should understand that they will have to provide world class research to pull said students and researchers in the future. In order to remain attractive, they will need to open up to business and international collaboration, which may also help to leverage new funds for sharing knowledge in particular R&D collaborations with business – while a potential source of income for research institutions – may well give an important boost to both quantity and quality of the research undertaken.

14. Resources are always limited in every organization, but the limited resources can be made more accessible. This can be achieved partially through synchronization of various Academic Institutes. Further through this research it can suggest that Academic Institutes can pool their staff for knowledge transfer, which can ensure that the skills are widely available through the region and various industries. In addition to this most effective way of sharing skills and knowledge among industry as well as academia can be movement of Human Resources between them.

15. Industry should also invite researchers from academic Institutes for Problem Solving, involving staff and students in new product development etc. By adopting this measure a two way interaction can be formed between Industry and Academia.

16. Researcher also suggests that in order to make a college education more effective, there should be periodic review and updation of course curriculum and to enhance the knowledge of teachers there must be faculty development and exchange programs. The findings also suggest that there must be Workshops, conferences and seminars for school students for there career development. engineering colleges should focus on Entrepreneurial education and development programs.

17. Institute/University should design their curriculum, which is strongly oriented towards solving industry issues as well technological challenges of the industries. In recruitment of the faculty member of academia, industry experience should be given preference and specific cell for Academia Industry interaction must be setup in each universities.

18. Colleges should Increase the focus on learning through live projects and internships. Institution should focus on industry sponsored labs and training centers in educational institutes. Institution should motivate faculties to undertake research and development workshops, seminars and conferences.

19. Employment generation is the important indicator of economic development so government should take initiatives for reducing the skill gap. Government should increase the collaboration between industries and educational institutes through various modes such as public private partnerships and special purpose vehicles. Government should provide funds to encourage the institutions and students to develop innovative and practical projects.

20. Lack of foreign direct investment and industrial investment is an economic factor which is responsible for skill mismatch in Madhya Pradesh. Cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living is another factor which is responsible for skill mismatch in Madhya Pradesh. Lack of job opportunities is an important factor for skill mismatch in Madhya Pradesh. Slowdown in the economy due to lack of growth and inflation is an economic factor which is responsible for skill mismatch in Madhya Pradesh. Low expenditure on education sector by Government due to fiscal constraints is an economic factor which is responsible for skill mismatch in Madhya Pradesh.

21. Government should reduce the cost of establishing industries in Madhya Pradesh to attract more industries for economic development. Government should reduce the cost of transportation for industries to attract more industries for economic development and also reducing the cost of electricity and fuel for industries helps

government to attract more industries for investment. Government should reduce the rate of taxes for industries to attract more industries for economic development. Reducing red tapism and number of permissions required for setting up of industries helps government to attract more industries for investment.

22. There are many reasons due to which the gap of demand and supply of the requisite skills by the industry and engineering aspirants is increasing, which lead to many consequences. Major consequences are to decrease in the number of enrolments and closure of engineering institutes and deviation of students to other graduate programs and certification courses. Lack of investment in education sector and increase the recruitment of substandard workforce is also major consequences of skill gap.

23. Engineering institute should provide effective training program in order to provide engineering workforce tailor made for industries. Most of the respondents agreed for Increasing the time duration of training. There must be Increase interaction between educational institutes and industries. Institute should provide interdisciplinary training in order to improve requisite skills in engineering aspirants. Institute must develop feedback mechanism to review effectiveness of training program. creation of Industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects and creation of incubation centers keeping in view local industry ecosystem requirements will reduce the skill gap.

24. In general it can be suggested that faculty members of the Academic Institutes should be encouraged so that they get engaged in suitable outside relationships with the industry. This would intern help them getting experience and knowledge

valuable to teaching and research and also help students gain richer educational opportunities and experiences. It is the responsibility of the Institutional administrators to establish appropriate norms and to assure the existence of an open environment for free exchange of ideas. There is development of Industry oriented training programs specifically designed with the help of industry experts. Establishing Industrial Mentorship programs to drive learning and development for both mentor and mentee.

25. Some miscellaneous suggestion are as follows:

- Use practical approach in curriculum preparation including updated technology.
- Encourage students to develop research oriented approach.
- Regular evaluation/ Monitoring of sanction funds for labs, machinery etc is required.
- Threshold education system for engineering. There must be a minimum criteria / common platform for all engineering institute.
- Training duration must increase at least 6 months so that students will able to understand work culture as well as try to establish good liaison with people.
- More focus on fundamental and basic knowledge
- In order to increase employment there must be a restriction on industry regarding recruitment like 70% from MP and 30% from other state.
- More efforts are required to improve the efficiency of Government colleges as in MP, majority of colleges are lacking in facilities and infrastructure.
- Faculty development programme on latest technology with practical knowledge.

- Need to upgrade the competency as well as talent , which will be totally depend on educational institute's strategy and planning.

6.3 CONCLUSION

On the basis of data analysis of responses collected from Academics, Industry representatives and student representatives, the following conclusions were drawn:

During the research it is found that there is need to make changes in our education system on the basis of analyzing foreign education policy and system. It is also require to develop a partnership between knowledge providers and knowledge users in order to sustain in this globalize society. Both academia and industry share a mutually beneficial relationship. The graduates produced by academia are absorbed by industry and research works in universities are taken up by the industry which turns them into product and services. Also industry expects from the academics the solution for some of their problems.

The research shows that the government should take initiatives for reducing the skill gap. Government should increase the collaboration between industries and educational institutes through various modes such as public private partnerships and special purpose vehicles. Government should provide funds to encourage the institutions and students to develop innovative and practical projects.

Research concluded with the fact that Lack of Foreign Direct Investment and Industrial Investment is an economic factor which is responsible for skill mismatch in Madhya Pradesh. Cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living is an another factor which is responsible for skill mismatch in Madhya Pradesh. Lack of job opportunities

is an important factor for skill mismatch in Madhya Pradesh. Slowdown in the economy due to lack of growth and inflation is an economic factor which is responsible for skill mismatch in Madhya Pradesh. Low expenditure on education sector by government due to fiscal constraints is an economic factor which is responsible for skill mismatch in Madhya Pradesh. The government should design there education policies to overcome these lacking factors.

Government should reduce the cost of establishing industries in Madhya Pradesh to attract more industries for economic development. Government should reduce the cost of transportation for industries to attract more industries for economic development and also reducing the cost of electricity and fuel for industries helps government to attract more industries for investment. Government should reduce the rate of taxes for industries to attract more industries for economic development. Reducing red tapism and number of permissions required for setting up of industries helps government to attract more industries for investment.

During the research it was also found that there are various factors that are responsible for skill enhancement are employability and entrepreneurial development, collaboration for skill enhancement, research advancement, Enhancement of teaching, Financial support, Recruitment and retention of staff.

One of the setbacks for students in an entry level job search is lack of experience and the solution to this problem is Internship. Hence, apart from organizing regular industrial visits, a good number of industrial internship should be included in the curriculum of the university. Industrial internship gives students an opportunity to learn the working of the organization where they will be supervised by work place

professionals and also they get an opportunity to achieve their learning goals, without the responsibilities of being a regular employee.

In today's competitive world institutions are now shifting from the traditional teaching to work-integrated learning in which students learn various knowledge and skills that are directly required by them in future in the workforce. For giving this knowledge, institutions invite various experts from industry as an adjunct faculty to gain from their experience. Institutions should become more industry focused by giving industry related training to their students by inviting expert from industry, with the aim to provide job ready work force with applicable industry relevant training. Universities also invite the industry representatives in designing its curriculum. This help the industry to get the workforce with the skills required and also helps the institutions in the job placement of their students.

The main conclusion of the study come out with the fact that there is lacking in demand and supply of requisite skills in engineering aspirants in Madhya Pradesh. Training and skill enhancement is having positive and significant impact on improving the employability, scientific & research productivity of students in India. This helps the researcher to design strategies by Industry and government to develop economic status of India

RESEARCH SUMMARY

RESEARCH SUMMARY

Assessing the factors responsible for mismatch between demand and supply of requisite skills in engineering aspirants with special reference to Madhya Pradesh, by Dr. Alpa Sethi. Amity University Madhya Pradesh, Gwalior, 2019-2022

This research work provides empirical analysis of various factors responsible for mismatch between demand and supply of requisite skills in engineering students. This study also brings out the list of requisite skills demanded by industrialists and skills supply by Academicians. Further this study highlighted consequences of mismatch as well as identified effectiveness and appropriateness of existing training program.

For the analysis, research work has targeted three populations: Engineering students, Engineering academicians and Industrialists (HR professionals) from IT, Automobile and Pharmacy industry with the sample of 300 each in Madhya Pradesh. Furthermore, Primary data was collected through questionnaire method and secondary data was collected through Internet, journal, magazines, government websites etc. After data were collected, proper tools and techniques like basic statistical methods like factor analysis, correlation and regression analysis, frequency analysis was applied for classification and analysis of data.

The detailed analysis revealed the results that inappropriate training program, lack of collaboration for skill enhancement, lack of innovation and creativity among students, lack of financial support from government, recruitment and retention of qualified teachers, economic and global factors and inappropriate teaching pedagogy methods are the main factors responsible for the mismatch. Furthermore, requisite skill demanded by industry is having positive and significant impact on employability

among engineering aspirants. As far as availability of skills are concern, the results shown that the most important and first available employability skill at fairly high level is Personal attributes skills in students , second is Communication skills; Third is Technical skills; Fourth is Management & Entrepreneurial skills and Fifth is Next generation skills. Further, the major consequences according to academicians are lack of investment in education sector, lack of innovation and creativity, increase in recruitment of substandard workforce and from industrialist's point of view number of enrolments and closure of engineering institutes, deviation of students to other graduate programs and certification courses and increase the recruitment of substandard workforce. In last, analysis on training effectiveness and appropriateness also revealed that training Programs provided by the institute are helpful in good placement after completing the engineering course.

END PROJECT DELIVERABLES

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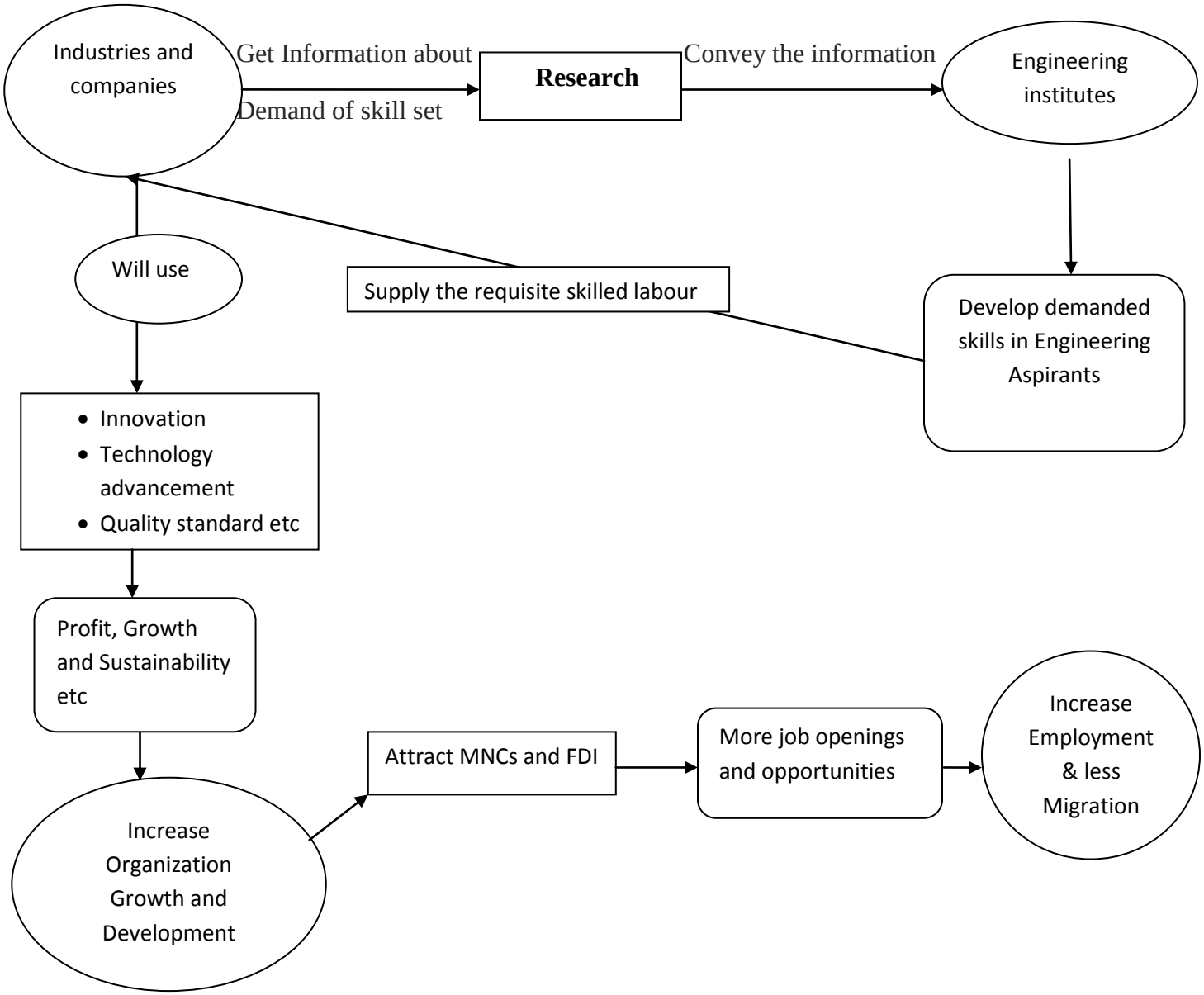
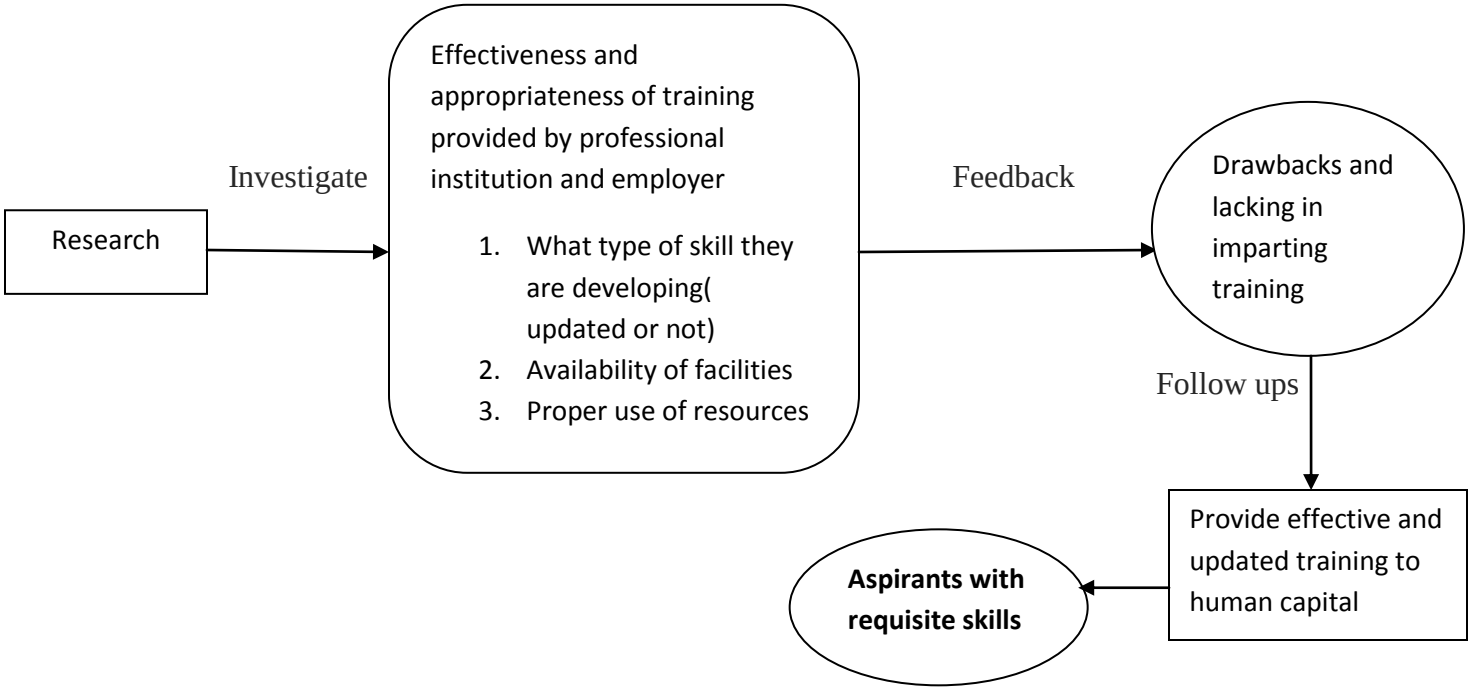
Every research is significant if it contributes and gives valuable outcomes. This study also contributes valuable deliverables which will be beneficial for various stakeholders like Engineering Academician, Engineering students, Industrialists and Government as well. The end project deliverables of this study are as follows:

1. Availability of requisite skilled manpower in labour market



This research outcome will provide sufficient information regarding demand of requisite skills among engineering aspirants which will be useful for engineering academicians to enhance that level of skills and make students readymade for industrialists . This will enable them to utilize those skills immediately in innovations, technology advancement and quality standards etc to contribute in the growth of organization. This situation will attract more MNCs and industry to establish. Once the industry start receiving requisite skills, it will develop more employment and it resulted into less migration and more stability of tenure.

2. This research will contribute to make training more effective and appropiate.



This research study has investigated the effectiveness and appropriateness of various training programs like summer internship, live projects, placement and communication, entrepreneurship and in-house training imparted to engineering students. Study also investigated the effectiveness of trainers, training facilities& infrastructure. The outcomes of the study will be beneficial for institutes and universities to not only identify the drawbacks/ lacking in existing training but also help to find out the solutions. This would result into aspirants with requisite skills.

KEY OUTCOMES OF THE PROJECT

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(How the outcome of this project will be beneficial to various stakeholders)

The study will be useful for a wide array of stakeholders as it presents through enormous research various recommendations and suggestions to reduce skill gap in engineering graduates and make them employable not just for present but also for future.

- The study helps to provide applicable framework which can be used by the government in formulating policies that could be used to make technical education agile and fluid in coping the various challenges of the future. Moreover, the study will give more idea about the area of working in education system.

- It helps to establish the role certain skill plays in getting graduates employable. Thus, it helps to provide guidance for the engineering graduates to help them to work on certain skills that might be the more relevant in the eyes of the employers.

- It helps to provide a working understanding on the course the academic institutes and universities need to follow in order to provide better overall engineering education.

- It helps to establish the effectiveness of the various types of training provides to the engineering graduates. It helps to outline the steps that should be taken to make these training much more relevant and effective.

- It helps the employers to understand the skills that engineering graduates often lack. This helps the employers in designing their training program with a relatively distinct edge catering to the specified skills rather than throwing darts in the dark and making a generalized assumption on the lack of skills of engineering graduates.

  Therefore, the study ventures into finding ways through which the skill gap could be diminished with some policy interventions by the government, support of academic organization and key guidance of industries in developing policies that could benefit all the stakeholders.

ANNEXURE

10.1 QUESTIONNAIRE FOR ENGINEERING ACADEMICIANS

1. Name of respondent:
2. Name of institution:
3. Type of Institution: ☐ Government
   ☐ Semi government
   ☐ Private
4. Age (in years):
5. Gender: ☐ Male ☐ Female
6. Qualification: ☐ B. Tech
   ☐ M. Tech
   ☐ MBA
   ☐ Ph. D
   ☐ Other
7. Experience (in Academics):
8. Experience (in Corporate):
9. Designation: ☐ Assistant Professor
   ☐ Associate Professor
   ☐ Professor
   ☐ Other
10. Choose the discipline you are associated with
    ☐ Computer Science / IT
    ☐ Mechanical
    ☐ Civil
    ☐ Electrical / Electronics / Communication
    ☐ Biotechnology
    ☐ Chemical
    ☐ Other

In your opinion, rate the availability of the following skills in engineering students who are about to leave the college in search of a job

11. Communication Skills -In your opinion, rate the availability of the following skills in engineering students who are about to leave the college in search of a job

Skills/Attributes	Completely missing	at Very low level	at Average level	at Fairly high level	Outstanding
basic written communication skills (English)					
Basic verbal communication skills (English)					
effective Pronunciation					
Active listening skills					
Group discussion skills					
Presentation skills					
Team communication skills					
Formal communication skills					
Ability to communicate in multiple languages					

11(b) Technical Skills - In your opinion, rate the availability of the following skills in engineering students who are about to leave the college in search of a job.

Skills/Attributes	Completely missing	at Very low level	at Average level	at Fairly high level	Outstanding
Basic numeracy and computational skills					
Database analysis and Management skills					
basic fundamental knowledge of mathematics, science and engineering					
ability to design a system, component, or process to meet desired needs					
ability to identify, formulate, and solve engineering problems					
ability to apply knowledge of mathematics, science and engineering practically					
in-depth technical competence in a specific engineering discipline					

11(c) Personal attributes, Self-Management skills and interpersonal Skills - In your opinion, rate the availability of the following skills in engineering students who are about to leave the college in search of a job

Skills/Attributes	Completely missing	at Very low level	at Average level	at Fairly high level	Outstanding
self-discipline, self-awareness and self-motivation					
Self-awareness					
Self-motivation					
Honesty					
Positive attitude					
Ability to withstand difficult situation (Resilience)					
Ability to continue in spite of difficulty or opposition (persistence)					
Conflict negotiation and resolution skills					
Being flexible as and when the situation demands					
Ability to take initiatives					
ability to work under pressure					
Effective time management skills					
Effective leadership skills					
Ability to work in teams					
Ability to have an understanding of ethical responsibilities and their commitments towards them					
Ability to accept professional responsibility and commitments					
Social and intercultural adaptability					
Ability to understand, acknowledge and value other cultures and diversity					
Ability and willingness to learn					
Good understanding of health and hygiene					
Personal grooming					

11 (d) Management and Entrepreneurial Skills - In your opinion, rate the availability of the following skills in engineering students who are about to leave the college in search of a job

Skills/Attributes	Completely missing	at Very low level	at Average level	at Fairly high level	Outstanding
Courage and risk-taking ability					
Critical thinking skills					
Effective Decision-making skills					
Curiosity					
Creativity and innovation					
Marketing of Concept/ Idea/ Product/ Service					
Project management					
Budget allocation and planning abilities					
Task delegation					
Organization management					
Ability to evaluate and review performance					
Ability to influence and persuade in order to achieve goals and objective					

11(e) Next Generation Skills - In your opinion, rate the availability of the following skills in engineering students who are about to leave the college in search of a job

Skills/Attributes	Completely missing	at Very low level	at Average level	at Fairly high level	Outstanding
Big data analysis skills					
Data warehousing and Data mining skills					
ability to write functionally correct code					
cyber security and analytics skills					
Machine learning					
Robotics					
cloud based computing and block chain technologies					
Internet of things (IOT)					
automation and artificial intelligence					

12. Do you think unavailability of requisite skills is one of the major reasons for high unemployment in engineering field?

- Strongly Agree

- Agree
- Neutral
- Disagree
- Strongly disagree

13. Do you think that there is a need to restructure the governing body of school education in order to make it more relevant for the dynamic needs and challenges in educational field?

☐ Highly Essential
☐ Essential
☐ Moderately Needed
☐ Less Essential
☐ Not At all Essential

14. What changes do you think should be implemented in our school education system

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Learning through practical projects, workshops, case studies and seminars					
Introduction of debates and presentations in the classroom					
Periodic updating of course curriculum					
Effective quality of teaching & learning infrastructure					
Appropriate teacher-student ratio in class room					
Introduction of personality development courses in schools					
Entrepreneurship development courses for school students					
Others					

15. Do you think there is a need of career guidance centers for the students at school level?

☐ Highly Essential
☐ Essential
☐ Moderately Needed

- ☐ Less Essential
- ☐ Not At all Essential

16. In your opinion, is there a need to refresh the curriculum of engineering designed by AICTE?

- ☐ Highly Essential
- ☐ Essential
- ☐ Moderately Needed
- ☐ Less Essential
- ☐ Not At all Essential

17. What changes do you think should be undertaken to refresh the curriculum?

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Maximum focus on learning through practical and live projects, case studies					
Organizing Workshops, seminars, webinars, conferences and guest lectures by industry experts					
Student exchange program with National and International educational institutes					
Entrepreneurial Education and Development program for engineering students					
Guest lectures by renowned faculties from National and International engineering institutes					
Flexible curriculum with interdisciplinary courses of Management, Law and Psychology					
Flexible curriculum with interdisciplinary courses of Management, Law and Psychology					
Providing access to new technological advancements like Internet of Things, Robotics etc. for engineering students					
Creating learning environment through various technological groups and clubs. For example, coding clubs, robotics club etc.					

18. Do you think, that there is a need to improve the teaching pedagogy of engineering faculties?

- ☐ Should be changed Completely
- ☐ Major changes are required
- ☐ Moderate Changes are required
- ☐ Little Changes are required
- ☐ No Change is Required at all

19. What steps do you think should be undertaken for improving teaching pedagogy??

Statements	STRONGLY AGREE	AGREE	NUETRAL	STRONGLY DISAGREE	DISAGREE
Conferences, seminars, webinars, workshops, guest lectures and training programs by industry experts for faculties.					
Faculty development and exchange programs with renowned National and International institutes					
Organizing and Motivating faculties to undertake research and development workshops, seminars and conferences					
Introduction of specific courses designed to provide industry application of theoretical concepts					
Others					

20. Do you think the curriculum of engineering should be designed to provide maximum practical exposure to students?

- ☐ Highly Essential
- ☐ Essential
- ☐ It's OK
- ☐ No need at all
- ☐ Other

21. What changes should be made in the curriculum?

- ☐ 4 years learning+1-year training
- ☐ 3 years learning+2 years practical
- ☐ 3 years learning+1 year practical
- ☐ Other

22. Do you think, government should implement the policy initiatives for reducing the skill mismatch?

- ☐ Highly Essential
- ☐ Essential
- ☐ It's OK
- ☐ No Need at all

23. What measures/initiatives do you think should be undertaken by the government for reducing the skill gap?

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Increasing collaboration between industries and educational institutes through various modes such as public private partnerships and special purpose vehicles					
Developing government sponsored skill development labs for engineering students					
Providing funds to encourage the institutions and students to develop innovative and practical projects					
Creation of Industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects					
Creation of incubation centers keeping in view local industry ecosystem requirements					

24. According to your opinion lack of easy accessibility of financial assistance is creating a barrier for skilled students to enroll in engineering courses

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

25. Suggest measures that should be undertaken for improving the accessibility of financial assistance for the students

Statements	STRONGLY AGREE	AGREE	NEUTRAL	STRONGLY DISAGREE	DISAGREE
Reducing the rate of education loans					
Encouraging banks, NBFCs and other financial institutions to provide interest free loans for underprivileged students					
Reducing the cost of engineering by setting ceiling for engineering fee (Especially for private colleges)					
Setting up of counselling centers to provide snapshot of the course contents of engineering program to make students familiar with the engineering program					
Other					

26. Do you think remuneration offered to engineers in India is as per the skills they possess?

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

27. In your opinion is there a need to establish more industries in Madhya Pradesh?

Highly Essential

Essential

It's OK

No need at all

Other:

28. Do you think training can be a viable solution to inculcate requisite skills required by industries in engineering students?

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

29. According to your opinion, what measures should be undertaken to create effective training program in order to provide engineering workforce tailor made for industries?

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Increase interaction between educational institutes and industries					
Providing interdisciplinary training in order to improve requisite skills in engineering aspirants					
Development of feedback mechanism to review effectiveness of training program					
Development of Industry oriented training programs specifically designed with the help of industry experts					
Establishing Industrial Mentorship programs to drive learning and development for both mentor and mentee					
Establishing industry sponsored training labs and apparatus in educational institutes					
Upgrading the labs/ training apparatus and infrastructure available in educational institutes					
Training should be imparted by expert of that particular field					
Increasing the time duration of training					

30. In your opinion what would be the consequences of mismatch between demand and supply of requisite skills

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Decrease in the number of enrollments and closure of engineering institutes					
Decrease in the employability of engineering students					
Deviation of students to other graduate programs and certification courses					
Lack of innovation and creativity					
Lack of investment in education sector					
Increase in recruitment of substandard workforce					
Increase in dependence on Automation and Robotics due to lack of skilled workforce					
Decrease in companies / organizations visiting engineering institutes for placement					
Increase in social, mental and health care problems					
Increase in suicide attempts					

31. Kindly express in your words what are the main reasons for engineering students find it difficult to get proper job for them.

10.2 QUESTIONNAIRE FOR INDUSTRALISTS/ HR PROFESSIONALS

1. Name of the organization:
2. Name of respondent:
3. Designation:
4. Experience:
5. Category of company: (Investment in plant and machinery/ equipment)

Classification	Manufacturing enterprises	Service enterprises
Micro	Rs. 25 lakhs	Rs. 10 lakhs
Small	Rs.25 lakh - 5 crore	Rs. 10 lakh – 2 crores
Medium	Rs 5 crore – 10 crores	Rs 2 crore – 5 crores
Large	More than 10 crores	More than 5 crores

Share your opinion on the demand/desirability of Requisite Employability Skills in Engineering aspirants.

6. In the present question some COMMUNICATION SKILLS are given please rate them on five-point Liker Scale from Most Desirable (5) ..... to Not Desirable at all (1)

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Basic written communication skills (English)					
Basic verbal communication skills (English)					
Effective Pronunciation					
Active listening skills					
Group Discussion skills					
Presentation skills					
Team communication skills					
Formal communication skills					
Ability to communicate in multiple languages					

7. In the present question some TECHNICAL SKILLS are given please rate them on five-point Liker Scale from Most Desirable (5) ..... to Not Desirable at all (1)

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Basic numeracy and computational skills					
Database Analysis and Management skills					
Basic fundamental knowledge of mathematics, science and engineering					
Ability to design a system, component, or process to meet desired needs					
Ability to identify, formulate, and solve engineering problems					
Ability to apply knowledge of mathematics, science and engineering practically					
In-depth technical competence in a specific engineering discipline					

8. In the present question some PERSONAL ATTRIBUTES, SELF MANAGEMENT SKILLS are given please rate them on five-point Likert Scale from Most Desirable (5) ..... to Not Desirable at all (1)

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Self-discipline					
Self- awareness					
Self- motivation					
Honesty					
Positive attitude					
Ability to withstand difficult situations (Resilience)					
Ability to continue in spite of difficulty or opposition (Persistence)					
Conflict negotiation and resolution skills					
Being flexible as and when the situation demands					
Ability to take initiatives					
Ability to work under pressure					
Effective time management skills					
Effective leadership skills					
Ability to work in teams					
Ability to have an understanding of ethical responsibilities and their commitments towards them					
Ability to accept professional responsibility and commitments					
Social and intercultural adaptability					
Ability to understand, acknowledge and value other cultures and diversity					
Ability and willingness to learn					
Good understanding of health and hygiene					
Personal grooming					

9. In the present question some MANAGEMENT AND ENTREPRENEURIAL SKILLS are given please rate them on five-point Likert Scale from Most Desirable (5) ..... to Not Desirable at all (1)

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Courage and risk-taking ability					
Critical thinking skills					
Effective Decision-making skills					
Curiosity					
Creativity and innovation					
Marketing of Concept/ Idea/ Product/ Service					
Project management					
Budget allocation and planning abilities					
Task delegation					
Organization management					
Ability to evaluate and review performance					
Ability to influence and persuade in order to achieve goals and objective					

10. In the present question some NEXT GENERATION SKILLS are given please rate them on five-point Likert Scale from Most Desirable (5) ..... to Not Desirable at all (1)

Skills/Attributes	Most desirable	Desirable	Moderately desirable	Not so desirable	Not at all desirable
Big data analysis skills					
Data warehousing and Data mining skills					
Ability to write functionally correct code					
Cyber security and Analytics skills					
Machine learning					
Robotics					
Knowledge about cloud-based computing					
Knowledge about Internet of things (IOT)					
Knowledge about automation and artificial intelligence					

Part II

Factors responsible for mismatch between demand and supply of requisite skills in Engineering Aspirants

11. Satisfaction with quality of education imparted in engineering colleges
    - Highly satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Highly dissatisfied

12. Do you think that following changes should be made so that college (Engineering) education can be made more effective?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Periodic review and updating of course curriculum					
Improvement in quality of teaching and learning infrastructure					
Workshops, conferences and seminars for school students					
Entrepreneurial education and development programs					
Faculty development and exchange programs for school teachers					

13. Any other change you want to suggest to make college/Engineering education more effective?

……
……

14. In your opinion is there a need to update the course curriculum as well as faculties of Engineering?
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree

15. Do you think that following changes should be made so to update the course curriculum so that college (Engineering) education can be made more effective?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Industry participation in designing the curriculum of engineering					
Workshops, seminars, conferences and guest lectures by industry experts					
Increasing the focus on learning through live projects and internships					
Entrepreneurial education and development programs					
Faculty development and exchange programs for engineering faculties					
Industry sponsored labs and training centers in educational institutes					
Industry sponsored incubation centers					
Organizing and Motivating faculties to undertake research and development workshops, seminars and conferences					

16. Any other changes that you want to suggest to update the course curriculum so that college (Engineering) education can be made more effective?

……
……

17. Do you think, government should implement the policy initiatives for reducing the skill mismatch?
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree

18. Do you think that following measures/initiatives should be undertaken by the government for reducing the skill gap?

Statements	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
Increasing collaboration between industries and educational institutes through various modes such as public private partnerships and special purpose vehicles					
Developing government sponsored skill development labs for engineering students					
Providing funds to encourage the institutions and students to develop innovative and practical projects.					
Creation of Industry academia hubs for joint consultations, designing of curriculum, joint research, sponsored projects					
Creation of incubation centers keeping in view local industry ecosystem requirements					

19. Any other measures/initiatives you want to suggest that should be undertaken by the government for reducing the skill gap?

……

……

20. Do you think certain economic and global factors are directly and indirectly responsible for skill mismatch in Madhya Pradesh?

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

21. Do you think following economic and global factors are directly and indirectly responsible for skill mismatch in Madhya Pradesh?

Statements	STRONGLY AGREE	AGREE	NEUTRAL	STRONGLY DISAGREE	DISAGREE
Lack of Foreign Direct Investment and Industrial Investment					
Cross border migration of engineering students to neighboring states due to better opportunities and increased standard of living					
Lack of job opportunities					
Slowdown in the economy due to lack of growth and inflation					
Low expenditure on education sector by Government due to fiscal constraints					

22. Any other economic and global factors you want to say about that are directly and indirectly responsible for skill mismatch in Madhya Pradesh...

……
……

23. Do you think there is a need to establish more industries in Madhya Pradesh?
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree

24. What measures could be undertaken to attract more industries in Madhya Pradesh?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Reducing the cost of establishing industries in Madhya Pradesh					
Reducing the cost of transportation for industries					
Reducing the cost of electricity and fuel					
Reducing the rate of taxes for industries					
Reducing red tapism and number of permissions required for setting up of industries					

25. Any other suggestion you want to give to attract more industries in Madhya Pradesh...

……
……..

Part III
Consequences of mismatch between demand and supply of requisite skills in Engineering aspirants

26. In your opinion what would be the consequences of mismatch between demand and supply of requisite skills?

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Decrease in the number of enrollments and closure of engineering institutes					
Decrease in the employability of engineering students					
Deviation of students to other graduate programs and certification courses					
Lack of innovation and creativity					
Lack of investment in education sector					
Increase in recruitment of substandard workforce					
Increase in dependence on Automation and Robotics due to lack of skilled workforce					
Decrease in companies / organizations visiting engineering institutes for placement.					
Increase in social, mental and health care problems					
Increase in suicide attempts					

Part IV
Share your opinion on effectiveness and appropriateness of training imparted to engineering students.

27. Do you think training can be a viable solution to inculcate requisite skills required by industries in engineering students?

    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree

28. In your opinion, what measures should be undertaken to create effective training program in order to provide engineering workforce tailor made for industries?

Statements	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Increase interaction between educational institutes and industries					
Providing interdisciplinary training in order to improve requisite skills in engineering aspirants					
Development of feedback mechanism to review effectiveness of training program					
Development of Industry oriented training programs specifically designed with the help of industry experts					
Establishing Industrial Mentorship programs to drive learning and development for both mentor and mentee					
Establishing industry sponsored training labs and apparatus in educational institutes					
Training should be imparted by expert of that particular field					
Increasing the time duration of training					

29. Anything other than you want to suggests that should be undertaken to create effective training program in order to provide engineering workforce tailor made for industries....

.....

.....

30. Any other suggestion you want to make...

.....

.....

10.3 QUESTIONNAIRE FOR ENGINEERING STUDENTS

1. Your name:
2. Age of the respondents:
3. Gender: ☐ Male ☐ Female
4. Name of the Institute/college
5. Location
6. Type of university to which your college is Affiliated.
    - Central University
    - Government
    - Semi-Government
    - Private university
    - Deemed university
7. Semester:
8. Choose the discipline you are associated with:
    a. Computer Science/ IT
    b. Mechanical
    c. Civil
    d. Electrical/ Electronics/ communication
    e. Biotechnology
    f. Chemical
    g. Others (Please Specify) ……
9. Type of training programs provided to you by the institute.
    1. Summer internship, live projects and industry sponsored training program
    2. In-house training program/ Classroom training
    3. Placement support and communication skills training
    4. Managerial and entrepreneurial development training
    5. Other:

10. Number of Summer internship, live projects and industry sponsored training program attended by you during the engineering program? (If more than six programs attended then write the number of programs attended in other option box)

    - One
    - Two
    - Three
    - Four
    - Five
    - Six
    - Other……

11. What was the duration of the training program?

    i. 12 week
    ii. 120 days
    iii. 6 months
    iv. 1 year
    v. 1-1.5 years

12. To what extent you are satisfied with duration of Summer internship, live projects and industry sponsored training program(s)

    - Highly Satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Highly Dissatisfied

13. In the present question some statements are given related to Summer internship, live projects and industry sponsored training program you joined. To what extent you are agree with these statements KINDLY RATE YOUR OPINION on five-point Likert Scale from Strongly Agree to Strongly Disagree).Do you think Summer internship, live projects and industry sponsored training programs were.....

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Able to achieve the objective it was meant for					
Enhance employability skills					
Well executed and well planed					
Able to provide knowledge and understanding of subject					
Able to provide practical experience of theoretical concepts					
Effective and informative					

14. To what extent you have acquired the following attributes during the Summer Internship Training program. Rate the statements on five-point Likert Scale from Full Extent to Not at all

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Ability to write functionally correct code					
Big Data analysis skills					
Confidence					
Conflict resolution skills					
Cyber security and Analytics skills					
Data warehousing and Data mining skills					
Decision making skills					
Engineering students have the Knowledge about Internet of things (IOT)					
Knowledge about automation and artificial intelligence					
Knowledge about cloud-based computing and block chain technologies					
Leadership skills					
Organizing skills					
Management and Entrepreneurial skills					
Planning skills					
Practical Knowledge about the subject					
Problem solving and critical thinking skills					
Project Management					
Self-management					
Teamwork					
Technical skills					
Time management skills					
Working under pressure					
Written and verbal communication skills					
Information and knowledge next technological skills such as IoT, cloud-based computing, robotics etc.					

15. Satisfaction with summer internship, Live projects, and Industry Sponsored Training Programs
    - Highly Satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Highly Dissatisfied

16. In the present question some statements are given related to Inhouse training program you joined. To what extent you are agree with these statements KINDLY RATE YOUR OPINION on five-point Likert Scale from Strongly Agree to Strongly Disagree.). Do you think Inhouse training programs were...

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Able to achieve the objective it was meant for					
Enhance employability skills					
Well executed and well planed					
Able to provide knowledge and understanding of subject					
Able to provide practical experience of theoretical concepts					
Effective and informative					

17. To what extent you have acquired the following attributes during the In-House Training program. Rate the statements on five-point Likert Scale from Full Extent to Not at all

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Ability to write functionally correct code					
Big Data analysis skills					
Confidence					
Conflict resolution skills					
Cyber security and Analytics skills					
Data warehousing and Data mining skills					
Decision making skills					
Engineering students have the Knowledge about Internet of things (IOT)					
Knowledge about automation and artificial intelligence					
Knowledge about cloud-based computing and block chain technologies					
Leadership skills					
Organizing skills					
Management and Entrepreneurial skills					
Planning skills					
Practical Knowledge about the subject					
Problem solving and critical thinking skills					
Project Management					
Self-management					
Teamwork					
Technical skills					
Time management skills					
Working under pressure					
Written and verbal communication skills					
Information and knowledge next technological skills such as IoT, cloud-based computing, robotics etc.					

In your opinion, what are factors responsible for limiting the effectiveness of training?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Inappropriate training Infrastructure, apparatus, tools, machinery, labs					
Insufficient duration of training					
Lack of well qualified training provider					
Lack of training sessions by Specialized experts of the particular field					
Lack of seriousness towards training program by student					
Lack of proper information by the industries to students					
Lack of industry sponsored training labs and apparatus in educational institutes					
No feedback mechanism to review effectiveness of training program					
Lack of multidisciplinary training programs					

18. Satisfaction with In-House Training Programs
    - Highly Satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Highly Dissatisfied

19. In the present question some statements are given related to Placement Support and Communication Skill Training Program. Rate the following statements. To what extent you are agree with these statements KINDLY RATE YOUR OPINION on five point Likert Scale from Strongly Agree to Strongly Disagree.)..... Do you think Placement Support and Communication Skill Training Program were?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Able to achieve the objective it was meant for					
Enhance employability skills					
Well executed and well planed					
Able to provide knowledge and understanding of subject					
Able to provide practical experience of theoretical concepts					
Effective and informative					

20. To what extent you are satisfied with Placement Support and Communication Skill Training Program of your institute and their helpfulness in your good placement after completing the engineering course
    - Highly Satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Highly Dissatisfied

21. Is there any course or program in your curriculum for managerial and entrepreneurial training?
    - Yes
    - No
    - Other……

22. In your opinion is there a need for management and entrepreneurial training for engineering students.

    Highly Essential
    - Essential
    - Neutral
    - Less Essential
    - No need at all
    - other

23. To what extent you are agree with the following statements regarding training providers or trainers, on five-point Likert Scale from Strongly Agree to Strongly Disagree). Do you think Trainers / Training Providers?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Created an atmosphere of continuous learning					
Provided feedback at the end of training program					
Was able to establish and maintain good relationship with trainee					
Was an expert of his field					
Provided feedback at the end of training program					
Was interactive during the training program					
Was well qualified and experienced					
Enhance employability skills					
Well executed and well planed					
Able to provide knowledge and understanding of placement process and activities					
Effective and informative					

24. To what extent you felt / experienced following limitations during your training programs. Rate the statements on five-point Likert Scale from To a Very Great Extent .....to .....To a Very Less Extent / Negligible Extent?

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Inappropriate attention towards internship training by training and placement cell					
Insufficient duration of training					
Lack of appropriate training Infrastructure/ apparatus/ tools/ machinery/ labs in industries					
Lack of demo classes and role play activities					
Lack of encouragement by the educational institute/ Faculties to undertake industry sponsored training program					
Lack of encouragement by the educational institute/ Faculties to undertake Live Projects					
Lack of good network with industries					
Lack of good working environment in industries					
Lack of incubation centers in educational institutes					
Lack of industry sponsored training labs and apparatus in educational institutes					
Lack of information and awareness regarding Industry sponsored training program					
Lack of information and awareness regarding Live Projects					
Lack of information and support provided by the educational institutes with regard to Summer Internship training program					
Lack of interest towards training program by the trainer					
Lack of multidisciplinary training programs					
Lack of Pre- SIP training by the educational institute					
Lack of proper information by the industries to students					
Lack of proper training Infrastructure					
Lack of proper training provider					
Lack of seriousness to undertake Live Projects by the students					
Lack of seriousness towards training program by student					
Lack of training sessions by Specialized experts of the particular field					
Lack of well qualified training provide					
No feedback mechanism to review effectiveness of training program					

25. In your opinion what should be done to improve effectiveness of the internship / training programs (If you feel these training programs are ineffective)?

_____

_____

26. To what extent do you think that following steps will make engineering program more accessible

Statements	Highly Essential	Essential	Moderately needed	Less Essential	Not at all essential
Reducing the rate of education loans					
Interest free education loans for underprivileged students					
Reducing the cost of engineering by setting ceiling for engineering fee					
Providing funds to engineering students for student exchange programmes					
Students interaction with industry experts to provide insight about the engineering program					
Setting up of counselling centers to provide snapshot of the course contents of engineering program to make students familiar with the engineering program					

27. To what extent following facilities are LACKING and need to be improved in your institute?

Statements	Highly Essential	Essential	Moderately needed	Less Essential	Not at all essential
Proper internet facilities in campus					
Equipments in laboratories					
Library					
Computer Labs					
E- Learning resources					
Technology Clubs					
Incubation center					
Entrepreneurship Cell					

28. What major challenges did you face while searching for a Job?

Statements	To a Very Great Extent	To a Great extent	To a moderate extent	To a Lesser Extent	Not at all
Finding the right company to apply					
Finding the right Profile to apply					
Clearing interviews					
Clearing written test					
Clearing eligibility criteria					
Clearing Group Discussion					
Appropriate remuneration offered by the company					
Insufficient ability as per the requirements of the industry					