FACTORS THAT PROMOTE AND INHIBIT SUCCESSFUL SCHOOL-TO-WORK TRANSITIONS AMONG ENGINEERING STUDENTS IN INDIA

by

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Dedication

This thesis is a tribute to my beloved spouse, Kavitha, and our cherished daughter, Sai Keerthana, whose unwavering support and boundless love have been the cornerstone of my journey.

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ABSTRACT

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Education plays a crucial role in enabling individuals to lead fulfilling lives while also supporting themselves financially. Within this context, successful transitions from school to the workforce are pivotal for personal, societal, and economic development. In India, engineering education holds particular significance due to its evolution over recent decades, playing a central role in the country's growth, modernization, and workforce development. This study represents a pioneering effort to identify the factors that promote or inhibit successful school-to-work transitions among engineering students in India. Through an exploratory research approach, combining survey data from engineering students of diverse backgrounds, interviews with training and placement officers, and a family member survey, this study aims to shed light on this critical issue. The study has explored two primary hypotheses: the significance of internships in facilitating successful

transitions and the potential hindrance of solely academic excellence without exposure to market-relevant skills. The findings underscore the importance of collaboration between industry and academia to enhance school-to-work transitions. Key factors identified as promoting successful transitions include internships, market-relevant skills, soft skills, placement preparation, and networking. Conversely, factors inhibiting successful transitions include a sole focus on academic performance, failure to seek early support, lack of in-depth knowledge, neglect of priorities, and an inadequate understanding of one's strengths. This study contributes to the ongoing discourse on improving school-to-work transitions. It highlights the critical role of collaboration between stakeholders in fostering successful transitions for engineering students in India.

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CHAPTER I:

INTRODUCTION

1.1 Introduction

In an ideal and utopian world, a society where each individual not only fulfills their basic needs but also realizes their dreams and aspirations throughout their lifetime embodies genuine happiness. The foundation of this contentment lies in the ability of every person to secure a livelihood, which, in turn, is contingent upon possessing the requisite skills, knowledge, and capabilities demanded by the job market.

The journey toward financial independence typically begins in youth, and two indispensable factors contribute significantly to this process. First, education plays a pivotal role by imparting the necessary skills and knowledge, enabling individuals to navigate the complex terrain of the professional world. Second, the ability to manage early life transitions becomes crucial, as any alteration in life circumstances, whether transitioning from education to employment or changing career paths, demands a nuanced understanding, meticulous preparation, proactive initiation, and a robust support system.

In general, life transitions are inherently challenging. Whether it be pivotal life events, the shift from college to the workforce, assuming a new job role, or transitioning between career fields, each change necessitates a comprehensive approach involving understanding, preparation, initiation, and support. Adequately preparing for these transitions entails cultivating adaptable skills and a breadth of knowledge that can be applied seamlessly in diverse contexts.

A fundamental aspect of achieving financial independence is the ability to transition smoothly into the workforce post-education. A smooth transition into paid work not only contributes to an individual's self-sufficiency but also fuels the overall economic growth of the world. Opting for a position that not only provides financial remuneration but also

imbues one's work with meaning and purpose is critical to fostering engagement, thereby facilitating the pursuit of a fulfilling and satisfying career. Specific educational programs tailored to the transition from school to work equip students with up-to-date skills, knowledge, and industry exposure. Such programs bridge the gap between academia and industry by creating a symbiotic relationship wherein the latter communicates its evolving needs for skills and knowledge, offering students opportunities for firsthand work experience while still in college.

The synergy between industry and academia in elucidating future skills requirements and facilitating experiential learning during the educational phase can lead to the development of effective transition programs in schools and colleges. This collaborative effort not only equips individuals with the tools they need for a successful transition but also aligns educational curricula with the dynamic demands of the professional landscape, fostering a seamless and purposeful journey from education to employment. In essence, a harmonious collaboration between academic institutions and industries is the linchpin for nurturing a society where each individual can confidently navigate life transitions and embark on a fulfilling and meaningful career path.

The school-to-work transition encapsulates a comprehensive spectrum of activities, programs, processes, and training meticulously crafted to equip students for the commencement of their professional journeys. Undoubtedly, the knowledge and skills gained during the formative years of education contribute to workplace competence; however, one cannot overstate the pivotal role that the acquired knowledge and skills play in the latter stages of school or college. These concluding years serve as the crucible for a seamless transition into the professional realm and set the trajectory for one's career path during the initial phase of employment.

As a result, the preparation for the transition from educational institutions to the workplace has emerged as a captivating subject of global and country-specific research. The ever-evolving job market, economic landscape, government policies, and individual preferences profoundly influence the dynamics of this transition. Motivations, societal shifts, and personal perceptions further contribute to the intricate tapestry of school-to-work transitions, making it imperative to explore this phenomenon comprehensively.

Research in this domain not only sheds light on the factors influencing successful transitions but also plays a pivotal role in designing and refining school and college programs. By delving into the effectiveness of existing programs, researchers gain insights that enable them to develop theoretical models, forming the foundation for subsequent improvements. The synthesis of academic inquiry and practical application becomes instrumental in not only preparing students for the dynamic challenges of the workforce but also in ensuring that educational institutions remain responsive to the evolving needs of the professional landscape. Consequently, the ongoing research in this field serves as a guiding beacon, steering the enhancement of educational programs and policies to foster a more adept, resilient, and industry-ready generation of professionals.

In the contemporary landscape, a noticeable trend is emerging within the industry. A significant number of organizations are recalibrating the qualifications required for various positions, particularly those categorized as middle-skill positions, as highlighted in a provacative HBR artcile titled “Skills-Based Hiring Is on the Rise” (Fuller, Langer and Sigelman, 2022). The shift towards skill-based hiring is becoming increasingly prevalent, marking a departure from traditional degree-centric prerequisites. According to the authors of this researched article, the alteration in hiring dynamics is substantial, with a significant reduction in degree requirements observed across the spectrum of employment levels. Between 2017 and 2019, employers notably scaled back degree prerequisites for 46% of

middle-skill positions and 31% of high-skill positions, as per the article. This transformative shift is indicative of a broader industry realization that more than qualifications are needed to translate into practical job competency. The paradigm of entry-level selection processes is undergoing a profound redefinition. Organizations are embracing innovative approaches, incorporating Artificial Intelligence (AI) into recruitment processes, leveraging online channels for talent acquisition, conducting video interviews, and focusing on the assessment of soft skills. The integration of gamification has also become a notable trend, aiding in the identification of candidates who possess the technical expertise and interpersonal and problem-solving abilities crucial for modern workplaces.

This transformative shift in recruitment methodologies is a response to the growing disparity between job demand and supply. The conventional educational system is facing a challenge in keeping pace with the rapidly evolving skill requirements of the job market (Human Capital, 2021). The disconnect between the skills taught in colleges and the contemporary demands of the industry is prompting organizations to seek alternative and more dynamic methods of talent acquisition.

This phenomenon is not isolated to a specific region but instead reflects a global trend observed in numerous countries. The evolving nature of work, coupled with technological advancements, is reshaping the employment landscape, necessitating a recalibration of traditional hiring practices. As organizations adapt to this paradigm shift, the emphasis on skills, adaptability, and a holistic understanding of candidates' capabilities is becoming paramount. In this dynamic environment, it becomes crucial for industry and education to establish a symbiotic relationship to ensure that they adequately prepare the workforce to meet the challenges of the future job market.

The imperative to enhance the alignment between academic curricula and industry requirements has remained a persistent challenge, prompting a continuous reassessment of courses offered at universities and engineering institutions. This recalibration aims to bridge the discernible gap between the skill readiness of graduates and the practical demands of the industry (Büth *et al.*, 2017), particularly in the context of engineering education in India.

Recognizing this disconnection, it becomes evident that there is a pressing necessity for additional training to augment the skill sets of engineering students. This imperative highlights a significant demand for a more agile, flexible, and rapid response from academic institutes. The evolving nature of industries, driven by technological advancements and dynamic market needs, necessitates that academic institutions possess the capability to adapt swiftly and proactively.

To address this challenge effectively, universities and engineering institutions must cultivate an environment of continuous innovation in their curricular frameworks. This involves staying abreast of the latest industry trends, regularly updating course materials, and integrating real-world applications into academic programs. By fostering a symbiotic relationship between academia and industry, educational institutions can ensure that the rapidly changing professional landscape demands not only theoretical knowledge but also practical skills from their graduates.

Moreover, this ongoing dialogue between academia and industry catalyzes the development of specialized training programs and collaborative initiatives. These initiatives can provide students with exposure to industry practices, hands-on experience, and mentorship opportunities, enhancing their preparedness for the challenges of the workforce.

In essence, addressing the misalignment between academic studies and industry expectations necessitates a paradigm shift in educational institutions' approach. By cultivating agility, flexibility, and responsiveness, these institutions can proactively contribute to the development of a workforce that is not only academically proficient but also well-prepared to meet the dynamic challenges posed by contemporary industry. This transformative process ultimately contributes to the cultivation of professionals who can seamlessly integrate into the workforce, making meaningful contributions from the outset of their careers.

The magnitude of interest and participation in the Joint Entrance Examination (JEE) for B.E/B.Tech during February and March 2021 was indeed staggering, with a registration count surpassing 1.2 million students. This examination, particularly Paper 1, stands as a highly coveted assessment organized by the National Test Agency (NTA), operating under the Ministry of Education, Government of India, serving as a pivotal gateway for admission to esteemed engineering colleges in the country (NTA, 2021a, 2021b).

Delving into the enrollment and placement landscape, insights from the All-India Council of Technical Education (AICTE), a prominent governmental body in India, provide a comprehensive perspective. The AICTE website (AICTE, 2022) provides the latest available data, indicating that an average of 746,466 students enrolled in engineering programs across the nation. This education has a consequential impact, as reflected in the fact that, based on the statistics presented in Table 1, a substantial cohort of 367,384 students successfully secured on-campus placements during the preceding years.

These statistics not only underscore the immense competition and interest in engineering education but also highlight the significance of standardized examinations like JEE as a critical determinant for access to these coveted academic programs. The data further suggests a substantial demand for engineering education in India, with a sizable

proportion of graduates finding placement opportunities directly through their institutions. As the educational landscape continues to evolve, these enrollment and placement figures provide valuable insights into the dynamics of engineering education, emphasizing its crucial role in shaping the career trajectories of a multitude of students across the nation.

Table 1.1: 5-year engineering student numbers in India. Source:(AICTE, 2022)

Year	Approved Engineering Intake	Engineering Enrollment	Engineering Placement	Placement %
2016-17	1,566,391	790,651	365,294	46%
2017-18	1,484,824	754,230	345,201	46%
2018-19	1,414,766	727,629	398,142	55%
2019-20	1,340,795	745,823	398,546	53%
2020-21	1,296,941	714,000	329,741	46%

Studies conducted by policymakers and practitioners, employment metrics emerge as pivotal indicators of successful school-to-work transition within a specific geographic context. These metrics, encompassing employment and unemployment rates, activity and inactivity, and qualified education, are systematically gathered through labor surveys. These quantitative measures play an important role in gauging the effectiveness of educational systems in preparing individuals for the workforce.

However, a more comprehensive perspective on the success of school-to-work transitions extends beyond mere numerical metrics. Recognizing this, Generations Unlimited, in collaboration with UNICEF and the International Labor Organization, has outlined an action plan that advocates for a more nuanced evaluation. According to their strategic approach (Generations Unlimited, 2020), a truly accurate depiction of success in school-to-work transitions necessitates the incorporation of additional qualitative factors.

These include the quality of work, individual aspirations, and the alignment of skills with the requirements of the job market.

The expansion of assessment criteria to encompass these qualitative dimensions reflects an acknowledgment of the multifaceted nature of career success. The quality of work, for instance, delves into the nature of employment, considering factors such as job satisfaction, fulfillment, and alignment with personal aspirations. Individual aspirations are crucial in understanding whether individuals are attaining positions that align with their career goals, contributing to a sense of purpose and satisfaction. Additionally, addressing skill mismatches provides insights into the relevance and applicability of the skills acquired during education to the actual demands of the workforce.

Incorporating these nuanced aspects into the evaluation framework enhances the depth of understanding regarding the efficacy of school-to-work transitions. By embracing a more holistic approach that considers both quantitative and qualitative dimensions, policymakers and practitioners can formulate more effective strategies to facilitate seamless transitions from education to the workforce. Taking this expanded perspective not only enriches the assessment process but also contributes to the development of targeted interventions that better cater to the diverse needs and aspirations of the emerging workforce.

The landscape of school-to-work transitions for engineering students in India presents a dynamic interplay between the skills imparted by engineering institutions and the multifaceted needs of the industry. Despite existing gaps between the educational offerings and industry requirements, a considerable number of students successfully navigate this transition, embarking on their professional journeys. This observation underscores the presence of underlying factors that either foster or hinder successful

school-to-work transitions. Given the complexity of this process, understanding the intricate web of influences that contribute to these outcomes becomes imperative.

Against this backdrop, the overarching objective of this research project is to meticulously identify the factors that play a pivotal role in either promoting or inhibiting successful school-to-work transitions among engineering students in India. By delving into the experiences of individuals who have navigated this journey, the research aims to unravel the nuanced elements that contribute to their success or pose barriers. The investigation will encompass various dimensions, including educational, individual, and environmental factors, seeking to paint a comprehensive picture of the influences that shape this critical phase in the students' lives.

Moreover, beyond a descriptive analysis, the research endeavors to propose a robust conceptual framework tailored for engineering courses. This framework aims to address the identified factors and enhance the overall employability of engineering graduates. The conceptual framework will serve as a strategic blueprint, offering actionable insights for educational institutions to refine and align their curricula with the evolving demands of the industry. By bridging the gap between academic offerings and industry requisites, the proposed framework aspires to contribute to a more seamless and effective school-to-work transition for engineering students.

In essence, this research project seeks not only to illuminate the factors that influence school-to-work transitions among engineering students in India but also to provide a forward-looking solution in the form of a conceptual framework. Through this dual-pronged approach, the research aims to contribute meaningfully to the ongoing discourse on aligning education with industry needs and, in turn, fostering a workforce that is both skilled and readily adaptable to the ever-changing demands of the professional landscape.

1.2 Research Problem

1.2.1 Problem Statement

The landscape of research on engineering education in India encompasses diverse dimensions, each shedding light on critical facets of the educational ecosystem. Scholars have delved into the quality of engineering colleges, examining aspects such as infrastructure, faculty expertise, and academic outcomes (Kalyan and PrasannaV, 2020). Affirmative action in admissions has been a subject of investigation, exploring the impact of policies aimed at fostering diversity in engineering colleges (Bertrand, Hanna and Mullainathan, 2010). Researchers have also probed into the reforms necessary for enhancing the effectiveness of engineering colleges, addressing issues of curriculum, pedagogy, and institutional governance (Mohan Reddy, 2018).

The future trajectory of engineering education has been a topic of scholarly discourse, contemplating the evolving dynamics of technology, industry needs, and educational paradigms (Rao, 2014). Concurrently, the scarcity of qualified faculty in engineering colleges has garnered attention, with studies examining the implications for academic quality and student learning outcomes (Mohanty and Dash, 2016). Additionally, the focus on employability skills has been instrumental, with research investigating the alignment between the skills imparted in engineering education and the demands of the job market (Ajit *et al.*, 2021).

However, within this expansive landscape, a noticeable research gap exists concerning school-to-work transitions for engineering students in India (Pilz, 2018). The novelty of the current research lies in its distinct focus on the "school-to-work" transition, a critical phase for the formidable workforce of engineering graduates that emerges annually. This research seeks to contribute significantly by identifying factors that both

promote and inhibit successful school-to-work transitions within a defined subset of students.

The unique contribution of this study becomes particularly evident in the context of the limited existing literature on this specific dimension of engineering education in India. As the first of its kind, this research lays the groundwork for future studies examining similar groups or expanding the scope to encompass larger cohorts of students. The insights derived from this pioneering research can serve as a valuable foundation, facilitating a more comprehensive understanding of school-to-work transitions among engineering students in India in subsequent studies. Thus, the significance of this research extends beyond its immediate findings, offering a catalyst for further exploration and nuanced insights into a crucial phase of the academic and professional journey for engineering graduates in the country.

An individual's successful school-to-work transition can be objectively defined as meeting the following criteria:

1. They are securing a stable job with a minimum one-year contract at the conclusion of their education.
2. Self-assessing that their education aligns with their current job position, thereby indicating satisfaction.

Studies conducted by (Neumark, 2007) have examined the necessity of incorporating vocational education or courses into the academic curriculum to enhance school-to-work transitions.

In India, engineering stands as a widely favored academic pursuit among numerous young individuals, primarily due to the promising job opportunities presented by the flourishing Information Technology (IT) and IT-enabled services sector. Mainly, Information Science, Electronics, Electrical, and Instrumentation, offered by the

Department of Computer Science, emerge as sought-after branches, garnering preference from IT and IT-enabled service companies for recruitment. These branches gain significance because they closely align with the requirements of the growing industry.

As per data from Statista (Statista Research Department, 2021a), in 2019, India witnessed a staggering enrollment of 3.2 million students across five engineering disciplines. However, despite the popularity of engineering as a field of study and the considerable number of students opting for it, a concerning trend emerges from another statistic provided by Statista (Statista Research Department, 2021b). The data indicates that in the year 2021, a noteworthy 46.58% of engineering graduates faced unemployment, signaling a substantial gap between the number of engineering graduates and available employment opportunities.

This disparity between the high enrollment rates and the significant percentage of unemployed engineering graduates raises pertinent questions about the alignment of academic curricula with industry demands and the overall employability of engineering graduates. The statistic prompts a thorough examination of the factors contributing to the unemployment rate among engineering graduates, highlighting the necessity for strategic interventions to bridge the gap between academia and the evolving demands of the job market. Addressing this challenge is pivotal to ensure that the aspirations of engineering students align with the realities of the professional landscape, fostering a more effective and purposeful integration of talent into the workforce.

1.2.2 Internships and School-to-work Transition

The current study focuses exclusively on exploring school-to-work transitions among engineering students in India, specifically those pursuing circuit branches. This targeted approach allows for a more in-depth analysis within a specific academic domain. The engineering students under investigation benefit from valuable industry exposure

facilitated through various channels and forums. Numerous colleges actively support these industry connections by organizing events such as industry talks, conferences, panel discussions, industry expos, and designated Industry days. Additionally, students often engage in internships that serve as a practical bridge between academic learning and real-world application.

This exposure to the industry is deemed indispensable in the context of the job search process. As established by Wilson and Deep Singh (2020), one of the significant impediments faced by engineering students in India is the need for sufficient industry exposure. While academic institutions offer a blend of theoretical and practical courses, incorporating projects into the curriculum, the provision of industry internships becomes a crucial element. Many colleges integrate these opportunities into the 8-semester/4-year engineering course, offering internships of varying durations, ranging from short-term assignments lasting two months to more extensive six-month engagements. This strategic incorporation ensures that students not only acquire theoretical knowledge but also develop practical skills and familiarity with industry dynamics, enhancing their overall readiness for the transition from academia to the professional workforce.

Hypothesis 1: Any short or long-term internship promotes successful school-to-work transitions.

1.2.3 Academic Performance and School-to-work Transition

The prevailing scenario in the educational landscape, as identified by Neelam (2018), manifests a discernible trend: a decline in the number of students successfully graduating compared to the number of students securing placements. This discrepancy underscores a substantial challenge in the contemporary academic paradigm, where the transition from education to the workforce faces intricate complexities. The shifting dynamics of skill demands within the job market exacerbate the situation, continually

creating a rift between the academic courses provided by colleges and the dynamic requirements of the industry.

Traditionally, academic performance served as a benchmark and a reliable indicator of an individual's preparedness for successful school-to-work transitions. However, the rapidly changing nature of industries and the emergence of new technologies have rendered this conventional metric obsolete. It is no longer sufficient to rely solely on academic achievements as a predictor of professional success. The inherent limitations of educational assessments in capturing the diverse and evolving skill sets demanded by the industry have become increasingly apparent.

In this context, the decline in the correlation between academic success and employability emphasizes the need for a comprehensive reevaluation of the factors influencing successful school-to-work transitions. The emphasis should shift towards a more holistic approach that considers practical skills, industry exposure, and maneuvering through dynamic work environments. This paradigm shift recognizes that a successful transition is contingent upon a blend of theoretical knowledge, practical application, and a nuanced understanding of the ever-changing demands of the professional landscape.

As the academic realm grapples with this evolving landscape, it becomes imperative for educational institutions to reassess their curricula, incorporate industry-relevant components, and provide opportunities for the practical application of knowledge. This adaptive approach aims to equip students with a well-rounded skill set, ensuring their preparedness for the challenges of the workforce and fostering a more seamless school-to-work transition. By acknowledging the limitations of conventional academic metrics and embracing a broader perspective on employability, educational institutions can play an essential role in shaping a workforce that is not only academically proficient but also agile, adaptable, and industry-ready.

Hypothesis 2: Only academic performance (better grades) without market-relevant training may inhibit successful school-to-work transitions.

This study, once completed, should advocate the need for two significant changes:

1. Mandatory Internships in engineering colleges with circuit branches. (Which is not the case today)

2. Student orientation towards market skills/demand right from the beginning of their engineering courses and NOT just on academic performance for Indian engineering students.

1.3 Purpose of Research

The successful transition from school to the professional domain constitutes a pivotal juncture in an individual's career trajectory. Within the context of Engineering Education in India, there has been a notable transformation. The field is currently undergoing a phase of growth, shedding its erstwhile image of antiquated education and evolving into an open, progressive, and modern domain. This evolution is driven by a commitment to adapt to the dynamic demands of the job market, ensuring that graduates are well-prepared for the challenges of the professional landscape.

However, the landscape of engineering education in India is diverse and multifaceted, marked by significant variations across different institutions. Disparities exist in admission procedures, popularity, demand, infrastructure, the availability of qualified and effective faculty, industry interface, the exposure provided by institutions, and the availability of placement opportunities. Given this breadth of differences, it becomes imperative to delve into the factors that either facilitate or hinder successful school-to-work transitions for engineering graduates.

This study aims to explore and identify the underlying factors that contribute to successful school-to-work transitions. It seeks to unravel the elements that act as catalysts

in supporting graduates as they navigate the crucial phase from education to employment. Additionally, the research endeavors to shed light on factors that pose impediments, hindering the smooth transition of engineering graduates into the workforce. By conducting a thorough analysis across a spectrum of institutions and considering a multitude of variables, the study aspires to provide nuanced insights that can inform strategies for enhancing the effectiveness of school-to-work transitions within the realm of engineering education in India.

In essence, this research embarks on a comprehensive exploration, recognizing the significance of the school-to-work transition and aiming to contribute valuable insights that can shape the future trajectory of engineering education in the country. The ultimate goal is to foster an educational landscape that not only imparts knowledge but also equips graduates with the skills, exposure, and support necessary for a seamless and successful transition into the professional realm.

1.4 Significance of the Study

In India, pursuing a 4-year engineering degree is an immensely coveted educational path, sought after for its track record of providing lucrative job opportunities, competitive remuneration, and avenues for continuous learning and growth. The decision-making process for students embarking on this academic journey begins as early as the 10th grade, requiring careful consideration to narrow down their choices for higher education. The preparation, both in terms of time and financial investment, to secure admission into the esteemed field of engineering is substantial, constituting a significant portion of the multi-billion-dollar education business in the country (Kaushik, 2020).

The demand for engineering seats far exceeds the available slots, resulting in a highly competitive scenario with a selection ratio as challenging as 1:1000x. Consequently, gaining admission into a preferred college and branch becomes a formidable challenge for

aspiring students. The competitive nature of the admission process adds complexity to the pursuit of securing a seat in a college of choice.

While the admission process forms one facet of the engineering education landscape, the pivotal element lies in the employment opportunities provided by the colleges during campus placements. The campus placement rates, however, hover around 45%, presenting an additional challenge for students who enter college with the expectation of securing a placement on campus. The likelihood of successful placement depends on a myriad of factors, including the knowledge and skills of the individual, their ability to present themselves effectively, the college's reputation attracting companies for placements, and the prevailing job market conditions in a given year (Rajini, 2017).

Figure 1.1: Changing Priorities of Millennials Example (Gallup Inc, 2016)

For college pass-outs, a successful school-to-work transition becomes imperative for realizing future career aspirations and charting a promising professional trajectory. While the necessity of earning a livelihood remains paramount, millennials exhibit distinct priorities in choosing a career, as revealed by Gallup (Gallup Inc, 2016). This study, focusing on factors influencing school-to-work transitions among Indian engineering students in circuit branches, assumes significance as it endeavors to explore and provide valuable insights through data. The objective is to identify opportunities for improvement

at various stages of both college and the initial years of a career, aiming for long-term benefits and enhanced success in navigating the transition from education to the professional realm.

1.5 Research Purpose and Questions

1. Which elements contribute to the smooth or successful school-to-work transition of engineering students in India?
2. What factors act as impediments to the smooth or successful school-to-work transition of engineering students in India?
3. How does the duration of internships (ranging from 4 weeks to 6 months) correlate with the success of engineering students in India in the school-to-work transition?
4. What is the relationship between academic performance (achieving 60%+ marks or a Cumulative Grade Point Average of 6.0 on a scale of 10) and the successful school-to-work transition of engineering students in India?

CHAPTER II:

REVIEW OF LITERATURE

2.1 Introduction

The concept of school-to-work transition encompasses a comprehensive array of activities, programs, processes, and training meticulously crafted to prepare students for the initiation of their professional careers. Although the knowledge acquired from the early years of education undoubtedly lays the foundation for workplace competency, the significance of the learning undertaken in the final years of school or college is paramount for facilitating a seamless transition into the professional sphere and achieving success therein. This recognition has propelled the preparation for the workplace into a focal point of research interest on a global scale and within individual countries.

The landscape of school-to-work transition has evolved into a multifaceted realm influenced by dynamic factors such as the ever-changing job market, economic fluctuations, government policies, and the intricate interplay of individual preferences shaped by motivations, societal shifts, and evolving perceptions. The convergence of these elements has intensified the need for research to delve into the intricacies of workplace preparedness. The quest for understanding and enhancing the transition from educational institutions to the workforce has become a crucial endeavor that spans both global and localized contexts.

In light of the evolving dynamics, researchers aim to dissect the complexities associated with workplace preparation, seeking insights that can inform effective strategies for facilitating successful transitions. This research delves into the nuances of individual

motivations, societal changes, and perceptual shifts, acknowledging their pivotal roles in shaping the landscape of school-to-work transitions. By scrutinizing these multifactorial influences, researchers aim to contribute meaningfully to the ongoing discourse, enabling educational institutions, policymakers, and individuals to navigate the evolving demands of the professional world successfully.

This comprehensive literature review endeavors to offer an expansive overview of existing scholarly works pertaining to school-to-work transitions. The review spans various dimensions, encompassing general school-to-work transitions, country-specific perspectives, factors contributing to the enhancement of school-to-work transitions, challenges encountered in this process, considerations related to Diversity and inclusion, and the nuanced realm of school-to-work transitions within the context of engineering education in India.

This literature review was compiled with an exhaustive keyword search across prominent academic platforms, including Google Scholar, Research Gate, and general Google Search. The search criteria included key terms such as "school-to-work transitions," "school-to-work India," "school-to-work transition theory," and "engineering education in India." This systematic approach aimed to cast a wide net, capturing relevant literature across diverse sources and ensuring a comprehensive representation of the current state of knowledge in each thematic area.

The literature review serves as a strategic exploration, drawing insights from a multitude of scholarly contributions to construct a coherent narrative that delineates the prevailing trends, challenges, and advancements in the realm of school-to-work transitions.

By navigating through a wealth of literature, this review aspires to contribute to a nuanced understanding of the multifaceted dynamics governing the transition from educational institutions to the professional realm. The inclusion of diverse perspectives and specific insights related to the unique context of engineering education in India adds granularity to the review, offering valuable considerations for educators, policymakers, and researchers alike.

Among the earliest contributions to the realm of school-to-work transitions is the seminal work titled "Worker Adjustment--Youth in Transition from School To Work, An Annotated Bibliography Of Recent Literature" by A.P, Dorothy P and Robert E (1968). This crucial literary work was carefully crafted to meet the requirements of practitioners and researchers involved in designing an exploratory study. The study aimed to delve into the significant socio-psychological challenges confronted by American youth falling within the age bracket of 16 to 25 years as they transitioned from the educational sphere to the professional realm.

As part of the Center for Vocational and Technical Education project, the compilation of this work specifically focused on addressing the research requirements of the ERIC Clearinghouse on that day's vocational and technical education. The comprehensive literature review, serving as an annotated bibliography, sought to facilitate a deeper understanding of the intricate dynamics surrounding the school-to-work transition for youth during that period. By synthesizing and organizing recent literature, the work targeted to provide a valuable resource for researchers, educators, and practitioners

navigating the challenges inherent in the transition process, contributing significantly to the early foundations of school-to-work literature.

In the complex landscape of education and employment transitions, a notable proportion of individuals opt to enter the workforce directly after completing their school education, constituting what is often referred to as the "forgotten half" in the realm of school-to-work transition research. Unfortunately, a significant gap exists in understanding and addressing the specific challenges faced by this cohort. This oversight highlights the need for a more comprehensive and inclusive approach to making the school-to-work transitions of the "forgotten half" more systematic, empowering, and equitable.

In addressing this gap, there was a detailed literature review focused on the school-to-work transitions of work-bound youth was conducted by Blustein, Juntunen and Worthington (2000), aiming to shed light on this understudied segment of the population. The authors undertake the task of providing not only an insightful analysis of the challenges faced by individuals entering the workforce directly but also a conceptual framework to understand the dynamics at play better. Furthermore, the review strives to pinpoint and recommend best practices aimed at improving the efficacy of school-to-work transitions for the frequently neglected "forgotten half." By exploring the distinctive experiences and requirements of this demographic, the literature review aims to offer valuable insights into the broader conversation on education and career trajectories. This endeavor seeks to promote a more inclusive and well-informed approach to school-to-work transitions.

Enhancements in research insights are intrinsic to the evolving nature of research methodologies. The domain of school-to-work transition research is no exception to this

rule. Historically, the approach to analyzing school-to-work transitions predominantly centered on single status changes, specifically transitions between education and unemployment. However, as longitudinal datasets became more prevalent compared to single status changes, observations on status change by Brzinsky-Fay (2014) and a persistent trend where studies continued to emphasize single status changes. These changes were determined not by theoretical underpinnings but rather by the specific research question or the availability of data, resulting in a selective analysis of micro-level transitions due to the absence of a common conceptual framework.

The consequence of this approach has been the potential oversight of crucial aspects within the life-course trajectory of school-to-work transitions. The researcher Brzinsky-Fay (2014) contends that the absence of a well-defined theoretical framework for understanding transitions and the approach to analyzing event changes could impede the acquisition of new scientific insights. To address this limitation, Christian proposes a shift towards a more comprehensive research design that combines explorative and hypothesis-testing methods. This approach brings a balance between the advantages and drawbacks of event and sequence methods in analyzing transitions. By advocating for a more integrated research design, Christian aims to foster a holistic understanding of school-to-work transitions, ensuring that the research captures the multifaceted nature of this critical life-course trajectory.

Upon a thorough examination of numerous journal articles, books, and working papers as part of the comprehensive literature survey, school-to-work transitions emerge as a multifaceted phenomenon that can be broadly categorized into six distinct classifications,

as visually represented in the accompanying diagram. This categorization synthesizes insights gleaned from an extensive exploration of scholarly contributions, offering a structured framework to comprehend the diverse dimensions of school-to-work transitions.

Additionally, a notable observation arising from this extensive literature review is the varying volume of research papers available on school-to-work transition studies. The distribution follows a descending order, with the United States being the focal point of a substantial portion of the research, followed by European countries, and then Asia. This observation underscores the regional variability and the prominence of the United States in the existing body of literature, signaling potential gaps or disparities in the global understanding of school-to-work transitions. The awareness of such variations contributes valuable context to the broader discourse on this critical aspect of educational and career pathways, facilitating a more nuanced and region-specific understanding of school-to-work transitions across diverse geographical contexts.

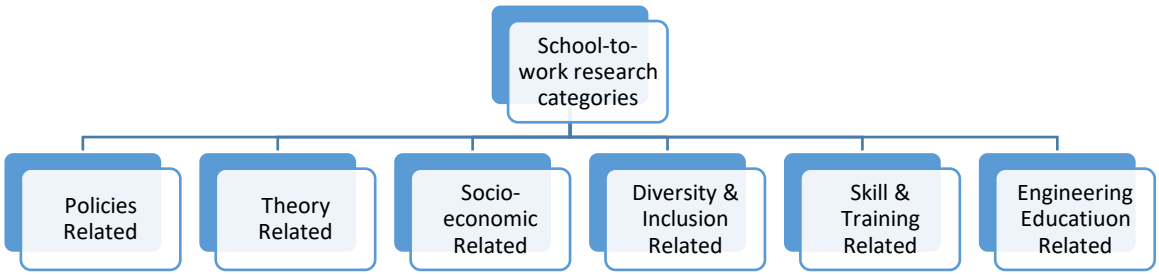

Figure 2.1: School-to-work research categories identified

The subsequent portions of this chapter are organized as follows: Following a chronological order for each category of the documents amassed on school-to-work

transitions; the review initiates with Policy-Related papers, followed by Theory-Related research, Socio-economic-related work, Diversity and inclusion-related literature, Training-related research, and ultimately, Engineering Education-related research.

2.2 Policy Related

Christian (2011) conducted an exhaustive international comparative study analyzing various countries, including Australia, Denmark, Finland, Germany, France, Norway, the United Kingdom, and the United States. The study explored critical questions related to school-to-work transitions, intending to unveil the intricate dynamics influenced by institutional frameworks on a global scale.

The study addressed a broad spectrum of specific questions:

1. How do institutional frameworks influence the complex landscape of school-to-work transitions?
2. Despite the forces of globalization and international integration, why is there a notable absence of convergence in observed institutional patterns?
3. To what extent do institutional configurations exert critical effects on the overall trajectory of school-to-work transitions?
4. In the context of transitions, how can one effectively explore and measure the processes when they unfold over an undermined length characterized by varying durations and complexities?

This comprehensive investigation not only aimed to provide insights into the comparative experiences of different nations but also sought to contribute valuable knowledge that can inform policies, implementations, and practices to enhance the

effectiveness and equity of school-to-work transitions across diverse institutional contexts. The study's international perspective enriched the understanding of the multifaceted nature of school-to-work transitions in a globalized context.

The dynamic landscape of school-to-work transitions is significantly shaped by the continuous evolution of government policies, responding to the ever-changing demands of the labor market. These policy adaptations play a pivotal role in fostering improvements in the transition process, ensuring that a nation's youth are well-prepared for promising job prospects after completing their education. The report by Kuenzi (2012) on STEM (Science, Technology, Engineering, and Mathematics) Education elucidates that the effectiveness of school-to-work transitions intricately links to the government's implemented policies. Contrary to the perception that the United States underperforms in STEM education, Kuenzi's analysis, based on graduate enrollments in the program, challenges this notion. However, amidst these observations, the author raises critical concerns regarding persistent academic achievement gaps among various demographic groups, the quality of STEM teachers, and the education system's ability to align with the demands of the STEM labor market. The report delves into the nuanced landscape of STEM education, shedding light on policy issues and programs that both support and hinder the effective implementation of STEM education initiatives. This comprehensive examination serves as a call to action for policymakers, educators, and stakeholders to address the identified challenges and optimize policy frameworks to enhance the overall efficacy of school-to-work transitions in the crucial STEM fields.

In a compilation of articles in a book titled "Transitions from Education to Work – Workforce Challenges in the Asia Pacific", edited by Cameron, Dhakal and Burgess (2018), researchers' contributions were categorized into three distinct parts. Part I focuses on elucidating the Issues and Challenges, offering an in-depth exploration of the multifaceted aspects surrounding the transition from education to the workforce. Part II delves into comprehensive Country Studies, providing nuanced insights into the specific challenges and dynamics present in individual nations within the Asia Pacific region. Part III encompasses a Comparative Analysis and Conclusions, facilitating a cross-regional examination and drawing overarching conclusions from the collective research contributions. This tripartite division enhances the accessibility and organization of the diverse perspectives presented in the articles, fostering a holistic understanding of the challenges and opportunities related to workforce readiness in the Asia Pacific context.

The Government of India has actively focused on the school-to-work transition in recent years. Mehrotra and Mehrotra (2018) highlight the proactive steps taken by the government, emphasizing improvements in articulating vocational education with higher education to dispel the 'dead end' perception associated with vocational training. A significant aspect of this initiative involves leveraging the National Skills Qualification Framework to facilitate a substantial shift, encouraging increased private sector involvement in skill development and creating enhanced opportunities for the youth. This strategic move aims to facilitate a seamless transition into the workforce. The paper underscores the government's dedication by delving into discussions on various programs and schemes aimed at addressing the evolving needs of the youth, particularly in cultivating

twenty-first-century skills. Through these efforts, the government actively bridges the gap between education and employment, ensuring that it equips the youth with the necessary skills and qualifications for a successful transition into the dynamic and competitive job market.

In examining the school-to-work transition across countries and periods, the authors Das and Kanjilal-Bhaduri (2018) address measurement challenges, particularly in assessing youth employment-related issues. The study categorizes transition problems into descriptive attributes and determinants. The findings emphasize the importance of reducing youth unemployment through policies promoting a work-related curriculum and reforming education systems. This education reform entails prioritizing vocational training and technical education in educational policies alongside other economic measures. Results indicate that higher education levels, combined with skill development through vocational training, enhance employment prospects, especially for full-time positions. The job outlook for new school leavers is influenced by the overall state of the labor market, with higher vulnerability noted for individuals with fewer educational qualifications and women. The paper concludes by recommending the extension of successful government responses to transition-related challenges to private educational institutions.

Organizations with a global reach, including the United Nations, UNICEF, and the International Labor Organization, as well as regional entities like the Asian Development Bank, exhibit a significant interest in the study of School-to-Work transitions. The imperative drives their involvement to provide valuable insights for policymaking, offering trends supported by specific data points and in-depth analysis. In doing so, these

organizations play a crucial role in guiding decisions made by diverse stakeholders involved in the realms of education and workforce development. A concrete illustration of this commitment is evident in a working paper authored by Alam and De Diego (2019) from the Office of Global Insights and Policy. This paper conducts an exhaustive analysis, exploring critical dimensions of school-to-work transitions and scrutinizing the existing situation in middle and low-income countries. The study extends to the intricate dynamics of skill demand, availability, and activation within the context of these transitions. Additionally, the paper delves into practical strategies for enhancing school-to-work transitions, introducing a robust theory of change framework. Through active participation in such studies, global organizations contribute substantially to the formulation of well-informed strategies and policies, ultimately fostering improved school-to-work transitions on a worldwide scale.

An active School-to-Work regime (SWT regime) represents the collection of institutions and rules overseeing the transition of young individuals from school to adulthood. In an insightful editorial article by Pastore and Zimmermann (2019), the authors undertake a thorough examination of school-to-work transitions in several European countries, specifically the Czech Republic, Germany, Italy, Poland, and Spain. Addressing a range of pertinent questions, the editorial aims to provide insights into essential aspects of these transitions:

1. Gender Differences in Work Entry: The article delves into whether gender disparities exist in the transition from school to the workforce.

2. Impact of Economic and Political Changes: The editorial seeks to understand how school-to-work transitions are affected by significant economic and political shifts as it explores their aftermath.
3. Policy Interventions for Enhanced Transition: This section focuses on the role of policy interventions in enhancing the speed and effectiveness of the School-to-Work transition.
4. Expectations of University Students: The article probes into university students' expectations regarding employment, offering insights into their aspirations and preferences.
5. Benefits of Studying Abroad: This section addresses the question of whether studying abroad yields tangible benefits in terms of career prospects and overall transition success.

By actively engaging with these critical questions, the editorial contributes valuable insights to the ongoing discourse surrounding School-to-Work transitions, offering practical considerations for policymakers, researchers, and stakeholders invested in the effective navigation of this crucial life phase.

Calling out the criticality of engagement with stakeholders, the Central Board of Secondary Education published a stakeholder engagement plan (Central Board of Secondary Education, 2021) to facilitate School-to-work transitions. The findings of the plan are as follows: The CBSE actively implements vocational training through a well-defined institutional mechanism, specifying roles for district-level officials and sub-district-level officials. Regular involvement of School Management Committees and

parents in awareness activities, along with social audits, enhances transparency and accountability at the school level. The CBSE emphasizes social inclusion and addresses the specific needs of students from Scheduled Castes, Scheduled Tribes, and children with special needs. Textbooks in the mother tongue are provided to tribal communities for ease of learning, promoting an inclusive environment. Policy frameworks like The Right of Children for Free and Compulsory Education Act, 2009 (Government of India, 2009)and the National Education Policy 2020 (2020a) address gender and social equity, and the CBSE focuses on improving vocational training uptake in aspirational districts. E-waste management at schools adheres to national guidelines, with disposal to designated recyclers. Stakeholders such as industry groups like CII and FICCI play vital roles in this comprehensive approach. The recommendation of the plan can be summarized as follows: There is a need to enhance the adoption of vocational training in Integrated Tribal Development Blocks (ITDA), and aspirational districts with a targeted approach and roadmap are essential. Establishing two-way information flows and feedback/grievance mechanisms is crucial for addressing queries, suggestions, and complaints from direct beneficiaries, including parents, students, teachers, and Principals. At the community level, School Management Committees (SMCs) actively monitor the effectiveness of vocational training and career counseling in schools, presenting opportunities for improved social outcomes through the integration of best practices, guidance, systematic monitoring, and alignment with the National Education Policy (NEP).

In a comprehensive treatment of school-to-work transitions in India to identify challenges and provide suggestions, a paper published by Institute for Human

Development (2022) is structured into eight sections, covering introduction, methodology, economic analysis, population, educational quality of employment, sector of employment, occupational distribution, and return to education. It also discusses School-to-Work (STW) transition outcomes and labor market policies/programs and concludes with a summary of challenges and policy suggestions. Here is a brief of challenges and recommendations discussed in the paper, as it provides the reader with more context and understanding of school-to-work transitions in India.

Challenge 1: Over the past two decades, India has experienced decent average economic growth, yet it has struggled to generate sufficient employment opportunities for its expanding youth population, leading to periods of jobless growth in the 2000-10 decade and job loss growth in the 2010-20 decade, indicating a declining capacity to create jobs for new entrants in the labor market.

Suggestion 1: Emphasize labor-intensive industries to address the high demand for both semi-skilled and skilled youth and implement active labor market policies to critically evaluate the effectiveness and performance of current education in relation to the evolving technological dynamics shaping the labor market.

Challenge 2: The contention is that harnessing the skills of the available youth and integrating them into the labor market can significantly contribute to elevated economic growth in the country.

Suggestion 2: The nation continues to possess the largest youth population for the next decade, presenting an immediate challenge of effectively harnessing the potential of this abundant human resource.

Challenge 3: Education provision at different levels involves both public and private entities and needs uniformity in its delivery across institutions.

Suggestion 3: Establishing uniformity across institutions is essential to ensure that employers receive accurate signals regarding the education and skill levels of the youth.

Challenge 4: The lack of coordination among various data collection agencies, utilizing different methodologies and resulting in duplicate, incomplete, or outdated information, hinders the holistic understanding of the current labor market and education conditions, with significant disparities in data about indicators such as skill demand, available skills, and job availability in both public and private sectors.

Suggestion 4: Efficient coordination among diverse data collection agencies is imperative to prevent duplication and optimize government resources. A strong emphasis is on promoting the use of Information and Communication Technology (ICT) to gather timely and accurate information on education, skills, and the labor market, benefiting policymakers, governments, educational institutions, employers, students, and youth.

Challenge 5: A dual challenge of unemployment and employability is evident, with a notable rise in youth unemployment, particularly among women and highly educated individuals. This creates a paradox where industries struggle with talent acquisition due to a lack of skilled workers despite a substantial pool of human capital while concurrently experiencing significant unemployment issues among highly educated individuals, emphasizing a critical two-way problem in the employment landscape.

Suggestion 5: Urgent attention is required to address critical factors contributing to skill gaps and mismatches, including inadequate skill foundations in early childhood and

primary education, barriers to accessing skill development opportunities, poor quality and market relevance of skill development systems, weak coordination and oversight, inefficient financing, lack of information on labor markets, misaligned study choices, and gender biases, with a focus on prioritizing solutions.

Challenge 6: The substantial dropout rate of nearly 20% at the secondary level poses a critical barrier to improving School-to-Work (STW) outcomes for the youth. The escalating number of NEET (Not in Education, Employment, or Training) individuals, especially young women, comprising one-third of the youth population, represents a significant challenge driven more by inactivity than unemployment; addressing this issue is crucial to prevent future economic losses and potential adverse social consequences for the country.

Suggestion 6: The absence of educational and vocational counseling in most Indian schools contributes to high dropout rates at the secondary and higher secondary levels, preventing students from accessing skill or vocational training due to a lack of information or guidance, leading to diminished interest in studies and a growing number of NEET individuals; thus, there is a critical need for comprehensive counseling and advice at the school/college level and within local communities to integrate youth into the mainstream, ensuring the availability of information on career options at various education levels for those transitioning out of school or in higher secondary levels.

Challenge 7: A formidable challenge is the imperative need to offer skill training for millions entering the job market annually. Only approximately 3 percent of the youth reported having received formal vocational/technical training in 2018-19, in stark contrast

to 50-80 percent in developed nations, and a noteworthy one-third of formally trained youth remain unemployed.

Suggestion 7: Addressing the low preference for vocational education/training among youth can be achieved by establishing a clear connection between vocational education and employability, with the implementation of a robust accreditation system and viable placement options.

Challenge 8: Gender, social, and geographical disparities are evident as rural youth are more inclined towards the informal sector, often in low-quality jobs, while urban youth, particularly women, face higher unemployment and NEET rates; marginalized groups (SC/ST) are vulnerable, engaged in the informal sector with lower education levels, and there is a substantial regional disparity. Despite government welfare programs aimed at providing better employment opportunities, challenges such as identifying suitable candidates and ensuring their work readiness post-training result in a significant number of trained youth remaining unemployed and involved in the low-paid informal sector.

Suggestion 8: Prioritize skill training aligned with local market demand, coupled with financial support and market linkage for trainees to engage in self-employment or local entrepreneurship, and ensure the provision of social security for informal sector workers to enhance their working conditions.

Challenge 9: A lack of coordination among government, industry, and school/college authorities is evident. The Indian labor market shows only 0.1 percent engagement in apprenticeships, involving just 25,000 employers out of 63 million enterprises and approximately 0.4 million apprentices. This reflects minimal private sector participation in

the youth School-to-Work (STW) transition despite the presence of the apprenticeship act and government-initiated corporate social responsibilities.

Suggestion 9: Establishing a well-defined institutional pathway for internships and apprenticeships is crucial, considering India's significant potential, with 70,000 registered employers on the apprenticeship portal. Recognizing that the future of learning lies in degree apprenticeships, an integrated approach involving academia, youth, and employers can effectively address youth unemployability by guiding them toward formal employment, necessitating amendments in the Act to expedite the inclusion of an increasing number of unemployed graduates.

In 2022, the European Commission designated it as the "European Year of Youth" to address challenges posed by COVID-19, particularly impacting youth unemployment and neither in employment nor in the education or training (NEET) category. Amid the digital revolution and the shift to a sustainable economy, the future of young people, especially those with lower skills, is at risk. The "European Green Deal" and "Just Transition Fund" focus on equitable shifts to renewable energy, while "Next Generation EU" targets a socially fair, sustainable recovery post-pandemic. Despite laudable initiatives, implementation gaps persist, highlighting the need for a structured approach. In a policy paper by Schmid et al. (2023), the authors propose that the theory of Transitional Labor Markets (TLM) offers insights and strategies for transitions into decent work for the youth.

2.3 Theory Related

Adopting a theoretical perspective on School-to-Work transitions, as proposed by Lent and Worthington (1999), the Career Development Quarterly serves as a platform for

articles delving into various prominent career development theories. These encompass a comprehensive exploration of person-environment fit, social learning, developmental, and social-cognitive theories. Traditionally, Vocational Theory has been a foundational reference in School-to-Work transition-related research preceding these articles. The journal actively endeavors to evaluate the practicality of these theories as frameworks for examining and facilitating the transition from school to work. By actively engaging with and evaluating diverse theoretical frameworks, the Career Development Quarterly contributes to the ongoing discourse on practical strategies and interventions that facilitate a seamless transition for individuals from the educational sphere to the professional world. This scholarly endeavor involves a critical examination of each theory's applicability and effectiveness in addressing the intricate dynamics of School-to-Work transitions. The exploration goes beyond mere recognition of these theories, aiming to comprehend the distinct contributions of each theory to our understanding of the intricate process of transitioning from the educational setting to the professional domain.

Furthermore, the journal aims to highlight the practical implications of these theories, emphasizing their potential as valuable templates for guiding research and interventions aimed at enhancing the School-to-Work transition experience. By actively scrutinizing the theories' utility, the Career Development Quarterly not only contributes to theoretical advancements in the field but also strives to offer practical insights that can inform policies, programs, and practices designed to facilitate a smoother and more successful transition for individuals entering the workforce.

In summary, this theoretical exploration within the pages of the Career Development Quarterly signifies a concerted effort to advance our understanding of School-to-Work transitions. It provides a foundation for future research and practical applications that can positively impact individuals navigating this crucial phase of their professional development.

In the UNICEF scoping paper titled "Unpacking School-to-Work Transition Data and Evidence Synthesis" by Alam and De Diego (2019), the authors emphasize the critical nature of school-to-work transitions in the lives of young people, underscoring their profound implications for future employment, well-being, and social connections. The paper highlights the significant weakness in the school-to-work transitions of young individuals in low and middle-income countries, indicating a need for more effective integration with labor markets. The authors delve into a detailed discussion of the drivers influencing these transitions, namely skill demand, skill availability, and skill activation. Drawing on survey findings, they propose a comprehensive package of diversified interventions tailored to the varied constraints of beneficiaries, including programs that profile and target specific needs, individualized follow-up, counseling, monitoring, and initiatives linking payments to beneficiary outcomes. Additionally, the authors introduce a theory of change framework to guide school-to-work transition efforts.

2.4 Socio-economic Related

The labor market, economy, government policies, employer engagement in shaping academic curricula, as well as individual preferences and motivations, are subject to ongoing and dynamic transformations on a global scale. Youth encounter evolving

challenges, prompting a continual evolution in the strategies employed to address them. Each country adapts its approach based on the maturity of its education system, the level of research undertaken, and the extent of stakeholder participation dedicated to resolving these challenges. As the landscape of work and education undergoes continuous shifts, proactive measures are essential to ensure that the education system remains responsive and equips the youth with the skills and knowledge needed to navigate the ever-changing demands of the contemporary world.

Indeed, socioeconomic backgrounds exert a discernible influence on the quality of school-to-work transitions. Drawing insights from longitudinal data gleaned from the Youth Development Study conducted in Minnesota, United States, in an article by Staff and Mortimer (2008), the authors contend that the trajectory of less intensive employment during high school, coupled with sustained part-time employment and subsequent investment in postsecondary education, tends to be more prevalent among youth hailing from higher-class origins. Conversely, they posit that such a trajectory is beneficial for young individuals emerging from lower socioeconomic backgrounds. The researchers further assert that an alternative path, characterized by early and rigorous work experience during high school, may be less advantageous in terms of long-term educational and wage outcomes. This dichotomy underscores the nuanced interplay between socioeconomic status and the various pathways pursued by youth during their transitions from school to work. The results emphasize the significance of acknowledging and confronting the impact of socioeconomic factors when devising effective strategies to assist a diverse range of individuals in attaining successful and gratifying transitions from school to work.

Undoubtedly, peer relationships wield a considerable influence over school-to-work transitions, a phenomenon extensively explored in a comprehensive study by Rüschoff (2015). This study meticulously addresses four key research questions, delving into the intricate dynamics of peer relationships during the transitional phase from school to work:

- How do individuals' work values during the transition influenced by interpersonal goals and relationship experiences with peers?
- Can an effective peer network contribute to individuals' engagement in career-directed behavior and its outcomes during and after the transition period?
- How does the onset of employment correlate with individuals' engagement in delinquent behavior across different age groups throughout adolescence?
- At the threshold of the transition from school to work, what types and behavioral associations characterize peer status?

The findings from the above study underscore the need for heightened attention to social relationships with peers when seeking to comprehend young people's transition from school to work. The author strongly emphasizes the significance of recognizing that young people do not make career decisions and develop behaviors in isolation. During this critical developmental period, individuals actively shape their choices and behaviors through interactions with significant others, frequently their peers. This insight emphasizes the intricate role that peer relationships play in shaping the attitudes, preferences, and behaviors of individuals during the pivotal transition from education to the workforce.

In another study on peer networks by Ruschoff et al. (2018), researchers delved into the role of young people's peer networks in facilitating successful school-to-work

transitions. The investigation sought to establish comprehensive correlations by examining the relationships between the size of peer networks, the self-efficacy of peers in their job search, and the outcomes of job search activities. The study revealed a positive association between peers' efficacy beliefs and the active engagement of young individuals in job search activities, particularly in completing a more substantial number of applications. Moreover, the study discovered that this heightened engagement indirectly correlated with enhanced job search outcomes, resulting in multiple job offers, irrespective of the size of the peer network. Moreover, the research shed light on the nuanced dynamics within peer networks, emphasizing the significance of peers' self-efficacy in influencing individual behaviors. The positive association between the efficacy beliefs of peers and the increased completion of job applications suggests that a supportive and confident peer environment can motivate young individuals to pursue employment opportunities actively. Interestingly, the study also identified an indirect association between the efficacy beliefs of peers and tangible job search outcomes, such as receiving multiple job offers. This connection remained significant even when considering variations in the size of the peer network. In essence, the findings highlight the dual role of peer networks – not only as a source of support and encouragement but also as a factor influencing the concrete outcomes of the school-to-work transition. Understanding the impact of peer dynamics on job search activities provides valuable insights for designing interventions and support systems aimed at enhancing successful transitions from school to work.

A study conducted by Kim and Lee (2018) aimed to identify resilient students in school-to-work transitions by gathering input through surveys administered twice, six

months apart, to final-year graduate students, categorizing the students into four groups—resilient, semi-challenged, competent-unchallenged, and maladaptive—was based on stressors and adaptation. The results indicated that members of the resilient group utilized cognitive emotion regulation strategies, including strategic planning, positive refocusing, and restructuring the situation with optimistic viewpoints. These results contrasted with the maladaptive group's approach, highlighting the adaptive and proactive nature of the resilient group in navigating the challenges of the school-to-work transition. After six months, the resilient group exhibited higher career satisfaction compared to the maladaptive group. Moreover, the study delved into the factors contributing to the resilience of students during the crucial transition period from school to work. The resilient group exhibited a proactive approach by employing strategic planning, focusing on positive aspects, and reshaping their perspectives optimistically. These cognitive emotion regulation strategies played a pivotal role in helping them navigate challenges and adapt successfully to the demands of the transitional phase.

Furthermore, the research shed light on the significant connection between resilient coping strategies and subsequent career satisfaction. Six months after the initial survey, members of the resilient group reported higher levels of satisfaction with their career choices compared to those in the maladaptive group. These results underscore the enduring impact of resilient behavior and adaptive strategies in shaping positive outcomes in the dynamic transition from academia to the professional realm.

Comparative studies play a crucial role in analyzing school-to-work transitions across different countries, highlighting variations, and, importantly, identifying potential best

practices for enhancing these transitions. In the case of Spain, researchers Vancea and Utzet (2018) undertook a comprehensive investigation into the socio-demographic characteristics of young people classified as not in education, employment, or training (NEETs). Their approach involved a comparative analysis with their non-NEET counterparts, focusing on factors such as social capital and family background. The findings of Vancea and Utzet's study revealed distinct patterns among Spanish NEETs. A notable observation was that a majority of these individuals exhibited lower educational levels and tended to be predominantly unemployed and married. However, there was an exception among NEETs aged between 18 and 24 years, as they exhibited relative inactivity and single status. This particular age group displayed a unique set of circumstances, deviating from the trends observed in the broader NEET population. Additionally, when contrasted with their non-NEET counterparts, Spanish NEETs displayed notable disparities. These results included a history of previous unemployment, a higher proportion of unemployed friends, and backgrounds associated with lower socio-economic status. These socio-demographic insights contribute significantly to our understanding of the challenges faced by NEETs in Spain. They can inform targeted interventions and policy measures aimed at facilitating more effective school-to-work transitions.

Does the state of the economy influence school-to-work transitions? The answer is yes. In their study on the impact of the Great Recession of 2008 on school-to-work transitions, Schoon and Bynner (2019) uncover evidence illustrating the effects of the recession on school-to-work transitions both before and after its occurrence. Their findings

demonstrated substantial variations among different countries, revealing a correlation between the existence of transition systems, acting as conduits between education and employment, and reduced levels of unemployment during periods of economic recession.

The study by Schoon and Bynner (2019) highlights one notable outcome: the impact of dedicated transition systems that act as bridges between education and employment. Countries with well-established transition systems exhibited lower levels of unemployment during recessionary periods. These observations suggest that the effectiveness and robustness of these transition mechanisms play a crucial role in addressing the adverse effects of economic downturns on school-to-work transitions.

In a thesis, Müller (2020) underscores the imperative role of robust social networks in facilitating entry into the labor market, thereby enhancing school-to-work transitions. Examining the context of Sweden, the study delves into three specific areas:

Firstly, the research highlights the substantial impact on graduates, both in the short and long term, when deprived of employer contacts during their school days due to factors such as establishment closures. However, as the study suggests, leveraging parents' workplaces can mitigate lost opportunities.

Secondly, the thesis illuminates the significance of relying on social contacts for job matching during various business cycles, emphasizing the role of social networks in navigating the dynamic nature of the labor market.

The third area of focus involves an investigation into the disparities in the utilization of social networks between students with highly educated parents and those with less-

educated parents. This exploration seeks to unveil potential inequalities in the leveraging of social connections for job-related opportunities.

India boasts one of the largest school education systems globally, encompassing 1.5 million schools, 8.5 million teachers, and approximately 250 million students. The successful transition from school to work is deemed crucial for fostering healthy and thriving communities. Beyond merely driving economic growth, empowering young individuals with the skills to navigate the future is seen as instrumental in securing their financial, psychological, and social well-being. Failure to align aspirations with opportunities for productive work may lead to adverse consequences such as increased economic vulnerability, distress migration, poor mental health, and unsafe behaviors among the youth. Current data from the International Labour Organization (ILO) indicates a persistent unemployment rate in India at just over 5 percent, with youth unemployment, a key marker of school-to-work transition, consistently rising and estimated to be at 32.5 percent, underscoring the significance of the study and its implications for facilitating successful transitions (Central Board of Secondary Education, 2021).

2.5 Diversity & Inclusion Related

Physical and mental health play pivotal roles in shaping an individual's life, especially during the challenging phase of school-to-work transition in youth. Researcher Phiri (2014) intervention-oriented study focuses on improving the school-to-work transition for individuals with Autism Spectrum Disorder (ASD) by examining the factors that either bolster or undermine self-determination within this specific demographic. Deliberate interventions aimed at enhancing the ability of individuals with ASD to act autonomously

and creating an environment conducive to their unique needs positively correlate with self-determination, as discerned by the research. These supportive measures significantly contribute to fostering self-determination among individuals with ASD during their school-to-work transition. Conversely, the study by Phiri (2014) also uncovers barriers that impede self-determination, particularly factors hindering the opportunity for individuals with ASD to acquire new skills. The inability to access skill development opportunities emerges as a significant obstacle, undermining the self-determination of students within the ASD spectrum. This nuanced exploration of the interplay between health, intervention strategies, and environmental factors provides valuable insights for improving the school-to-work transition experience for individuals with ASD, contributing to more inclusive and supportive practices in the education and employment sectors.

In a research thesis concentrating on the United States, Theodoto (2016) delves into the experiences of individuals with disabilities during school-to-work transitions, shedding light on the challenges faced by this particular student group. The findings reveal that various factors play a critical role in either promoting or hindering the successful completion of education or transition for these individuals. The identified sources encompass individual characteristics, the extent of inclusion in the institution, the influence of instructors, interactions with peers at school or college, and family-related considerations, all contributing to the nuanced landscape of school-to-work transitions for persons with disabilities.

Granato (2018) research, focusing on Italy, delves into the intricate relationship between gender inequality, wage gaps, and school-to-work transitions. The study

illuminates that the gender salary gap, ranging from 13 to 16%, can be traced back to the absence of mathematics in the educational courses predominantly chosen by women during their school and college years. This observation underscores the critical role that educational choices play in shaping the gendered dynamics of the workforce. It emphasizes the need for interventions that encourage women to pursue fields traditionally dominated by men. Moreover, the study extends its gaze beyond gender-specific issues to highlight broader challenges in the school-to-work transition landscape. The research underscores the long-term repercussions of skilled individuals opting for jobs beneath their qualifications during economic downturns. This phenomenon, termed "trickle-down unemployment," is identified as a consequence when highly qualified young people engage in employment beneath their capabilities, contributing to a cascading effect of unemployment across skill levels. Granato's work thus provides valuable insights into the intricate interplay between education, gender, and economic dynamics in the context of school-to-work transitions in Italy.

Researcher Nguyen (2020) delves into the intricacies of school-to-work transitions for persons with disabilities (PwDs) in Vietnam, with a primary focus on the School of Occupational Therapy. The study emphasizes the pivotal role of social attitudes within an inclusive education framework, highlighting its significance in fostering an inclusive school-to-work transition program. Nguyen's work underscores the importance of creating inclusive employment settings, emphasizing the need for a holistic approach to enable the social inclusion of young people with disabilities throughout their educational and vocational journeys. The research sheds light on the multifaceted challenges faced by

PwDs in the Vietnamese context and advocates for comprehensive strategies that not only address educational transitions but also emphasize the significance of inclusive societal attitudes and employment environments in shaping a more inclusive landscape for individuals with disabilities.

In a scholarly thesis, Theodoto (2016) delves deeply into the intricacies of school-to-work transitions for individuals with disabilities (PwDs) in the United States. Through meticulous exploration, the research unveils the distinctive challenges faced by this particular student demographic, offering valuable insights into the complexities surrounding their journey from education to the workforce. The study unveils critical factors that either facilitated or hindered individuals in completing their education and successfully transitioning to the workforce. The identified sources encompassed a range of influences, including individual factors, the level of inclusion within educational institutions, the role of instructors, interactions with peers at school or college, and the impact of family-related factors. Theodoto's comprehensive findings underscore the intricate web of elements that shape the educational and vocational trajectories of persons with disabilities. By dissecting the various sources affecting their school-to-work transitions, the research (Theodoto, 2016) provides valuable insights into developing more inclusive and supportive frameworks for this often marginalized demographic within the educational and employment spheres.

2.6 Skills and Training Related

Navigating the intricacies of school-to-work transitions, especially within the context of an apprenticeship program in carpentry in Canada, a study by Taylor (2006) sheds light

on the challenges inherent in fostering effective partnerships among key stakeholders. The stakeholders involved in this dynamic process include schools, trainers, employers, and policymakers. The study underscores the imperative to address various coordination challenges across these institutions, emphasizing the need for a cohesive approach to achieve agreement on shared goals. Moreover, it highlights the importance of gaining commitment from employers and cultivating a workplace culture that prioritizes continuous learning. Alison's research brings attention to the nuanced dynamics at play, emphasizing that successful school-to-work transitions rely heavily on the collaborative efforts of these stakeholders. By recognizing and addressing the challenges related to coordination, goal alignment, employer commitment, and a learning-centric workplace environment, stakeholders can contribute to more effective and seamless transitions for individuals entering the workforce.

A study delving into the nuanced realm of vocational programs and their role in school-to-work transitions by Atkins (2017), emphasizes the importance of understanding individual decision-making processes and experiences within these programs. Through an exploration of the relationship between individual positioning in various fields and career decision-making, Atkins draws insights from two narratives derived from a comprehensive study on young people's motivations for engaging in vocational programs. Atkins contends that personal social positioning holds substantial significance in shaping decision-making processes, influencing how individuals perceive and construct their career trajectories. The research underscores the intricate interplay between personal positioning, decision-making, and the impact of luck on the transitions of young individuals. By gaining insights

into these dynamics, stakeholders can enhance their understanding of the factors influencing vocational program choices and, subsequently, contribute to more informed and effective strategies for facilitating successful school-to-work transitions.

In the comprehensive Work-Based project report by Erasmus+ (2017), a meticulous comparative analysis of school-to-work transitions and work-based training across various European countries reveals a significant correlation between the youth unemployment rate and the extent of implementation of work-based training programs. The report underscores the pivotal role of a dual approach that combines theoretical knowledge with intentional practical applications of acquired skills through industry apprenticeships. This approach plays a crucial role in cultivating the skills, knowledge, and competencies necessary for individuals to secure gainful employment in a competitive job market. The report extends beyond observation, offering insightful recommendations for structural changes aimed at enhancing the overall landscape of school-to-work transitions. It emphasizes the need for collaborative efforts among diverse stakeholders, bringing them together to address three key components: Governance, Quality, and Partnerships. By focusing on these areas, the report advocates for a more holistic and collaborative approach that aligns educational systems, industry requirements, and policymaking to create an environment conducive to successful school-to-work transitions for the youth across Europe.

In a research on the school-to-work transition of Vocational Education and Training (VET) students in the Netherlands, by Dumhs (2019) delves into the critical role of resources in shaping this transition. Specifically, the study emphasizes the impact of mentoring, students' expectations, and the availability of financial means during the job

search process. These factors, according to Dumhs, play a substantial role in influencing, if not determining, the trajectory of school-to-work transitions for VET students.

The discourse surrounding the future of work in India predicts that while about half of existing jobs may be affected by automation, the creation of new jobs could offset net displacement. This scenario presents both risks and opportunities, with potential widening disparities and under/unemployment. Given the prevailing socio-economic inequalities in the country, certain groups face more significant disadvantages. To unlock their full potential, millions of young people grappling with deep-rooted disparities related to caste, class, gender, and poverty aspire to break free from these structural inequities. Competencies such as problem-solving, critical thinking, and collaboration are pivotal in enabling disadvantaged youth to escape poverty, shield themselves from economic and social vulnerability, and enhance mental well-being. An educational model emphasizing 21st-century skills can contribute significantly to achieving social justice, fostering participation in democratic institutions, and cultivating mindsets that prioritize addressing issues such as the climate crisis, sustainable development, and global peace. In a study on enabling school-to-work transitions by Quest Alliance (2021), the authors delve into a spectrum of related issues, aiming to comprehend the challenges and possibilities of integrating 21st-century skills into the Indian secondary school ecosystem through systemic change. The exploration incorporates multiple perspectives from teachers, implementation experts, education department officials, academics, and funders and outlines five proven intervention models to discern their change propositions.

World Economic Forum, in partnership with UNICEF and YuWaah, published an insights report on Education 4.0 India (World Economic Forum, 2022). Addressing a notable gap in foundational literacy and numeracy, the absence of easily digestible early learning content hampers children's engagement and parental involvement, reflected in grade 3 students' scores of 64.6% in language skills and 61.2% in mathematics in the National Achievement Survey 2021. Utilizing methods like storytelling, read-aloud sessions, and digital tools could enhance performance. Concurrently, the KINDLE approach underscores the imperative of improving teachers' capacity for newer educational formats, emphasizing their buy-in for tech-enabled curricula. The report advocates for digital and hybrid interventions to enhance students' skills during the school-to-work transition, stressing the necessity of improving the implementation of vocational education in 85% of schools. In order to address the digital divide, the report suggests categorizing schools based on their digital infrastructure access for targeted connectivity solutions.

In a school-to-work transition tracking report published by an NGO, Antarang Foundation (2023), the transition survey conducted in four cities in India (Mumbai, Pune, Udaipur, and Goa) reveals that Career Guidance (CG) influenced diverse career choices but faced challenges in translating preferences into actual decisions. Traditional paths persisted due to societal norms and gender biases, overshadowing programmatic influence. Approximately 36% transitioned without clear aspirations, often swayed by parental and peer opinions. Despite initiatives, a robust CG solution is imperative. Strengthening it involves equipping students to navigate biases, engaging parents and schools, and fostering awareness of alternative paths. Systemic efforts, such as school/college awareness

campaigns and increased government support, are vital. Complementing CG with state-level transition tracking ensures informed interventions, which is crucial for students to realize educational and career aspirations.

Developing new skills is the heart of the school-to-work transitions. Prompt engineering, an emerging field, optimizes Artificial Intelligence (AI) outputs through well-crafted prompts. As AI, especially in natural language processing, advances, demand for specialized prompt engineers grows. In a paper by George and Hovan George (2023), the authors evaluate India's potential to lead in prompt engineering by nurturing talent and implementing educational programs. Prompt engineering, spanning computer science, linguistics, psychology, and creativity, sees global demand growing at 20% annually. With a vast pool of 3.1 million annual engineering graduates and a thriving technology sector, India is well-positioned. Challenges include addressing AI education and research gaps, requiring strategic investments in curriculum, industry collaborations, and policy incentives. Collaboration among academia, industry, and government is vital for India to emerge as a hub for prompt engineering expertise in the 21st century, securing a technological advantage in the evolving digital landscape shaped by AI.

To bring a common understanding of the content and experiences for future skills, the World Economic Forum published a report, "Taxonomy for the Future of Learning" (World Economic Forum, 2023). As part of the Education 4.0 framework, the content consists of the following skills: Global Citizenship Skills, Innovation and Creativity Skills, Technology skills, and Interpersonal skills. The experiences part of the framework advocates the following: Personalized and self-paced learning, accessible and inclusive

learning, Problem-based and collaborative learning, and lifelong and student-driven learning.

There is a research study by Alam and Mohanty (2023) aimed to enhance the subject of happiness engineering by formulating a 'sustainable happiness curriculum' and 'pedagogical framework' for Indian schools through a holistic school approach. This approach was adopted for Indian schools considering available resources and feasibility and modeled as a traditional school subject, incorporating globally proven best practices in sustainability, adjectival, and well-being education. The curriculum proposes a 6-day-a-week class for grades 11 and 12, each lasting 45 minutes to 1 hour, devoid of formal exams. Recommended for all senior-secondary schools in India, the non-evaluative subject allows flexibility in module selection from three buckets—Happiness and Wellbeing, Sustainability Education, and Adjectival Education. The curriculum framework includes teaching-learning materials and teacher guidance for effective implementation.

Enhancing skills is crucial for boosting productivity and increasing the employability of both organized and unorganized sector workers. A prevalent skill gap significantly impacts employability across various sectors. Many perceive the National Education Policy 2020 as a positive development in addressing this challenge. It is undoubtedly an advantage that can help close the skill gap by imparting industry-relevant skills to students, preparing them as professionals for the future. A research paper on NEP 2020 by Prakash Bholane (2023) aims to examine the government's initiatives in skill development and assess the status of the skill gap in India. Additionally, it explores how

the National Education Policy plays an influential role in catalyzing efforts for skill development.

While there are several Government Skill programs, the study by Tripathi (2023) examines The Pradhan Mantri Kaushal Vikas Yojna (PMKVY) campaign, along with various other initiatives under the National Skill Development Corporation umbrella program. The goal of the author is to assess sector-specific skill requirements in different Indian states, identifying skill gaps across sectors. Another objective is to aid the skill development ministry in addressing challenges encountered in the implementation of the PMKVY campaign. Using the SPSS software, the paper employs the correlation coefficient to establish the relationship between the PMKVY scheme and skill creation. Results indicate a positive correlation between actual and estimated Human Resource Requirements in 22 key sectors, showcasing the PMKVY scheme's significant contribution to workforce skilling. The findings also reveal a highly positive relationship between variables, emphasizing the scheme's impact on candidate placement. Despite challenges like a shortage of highly skilled workers and the non-employability of a substantial group of educated unskilled youth, the study suggests improvements such as aligning skill training with industry demands and introducing at least one skill in every student from the school level.

Engineering students encounter pivotal decisions in choosing their careers, with the plethora of opportunities often leading to mismatched paths. A novel solution, the Graphology-based Career Analysis and Prediction System (G-CAPS), is proposed in a research paper by Archana, Anzar and Subheesh (2023), recognizing the need for tailored

career guidance. Rooted in artificial intelligence, G-CAPS employs advanced graphology tools to link handwriting features with individual personality traits, utilizing the Holland theory of vocational interests. Unlike existing systems, G-CAPS focuses on vocational personality traits in its graphology-based prediction model. The model, trainable and testable with engineering students' handwriting samples, utilizes Convolutional Neural Networks (CNN) to process distinctive features. The anticipated outcome is that G-CAPS effectively addresses career selection challenges for engineering students and graduates, offering a scalable solution with global applicability for informed career decisions in the engineering field.

2.7 Engineering Related

India, positioned as one of the world's developing nations, boasts an expansive labor force, a keen willingness to embrace the digital revolution through innovative approaches, active development projects spanning various sectors, rapid urbanization, and ongoing governmental initiatives to reform the education sector. This unique confluence of factors places India in a strategic position to compete globally. However, to fully capitalize on this potential, there is an imperative to enhance capacity, cultivate higher-order competencies, and foster employability skills, aligning them with the dynamic requirements of the ever-evolving market. The linchpin for achieving this transformation lies in ushering in substantial reforms within the landscape of engineering education in India. Such reforms are crucial to equip the workforce with the necessary skills and knowledge that align with the demands of the contemporary and future job market, ensuring India's sustained competitiveness on the global stage.

By addressing the complexities of the modern job market, these reforms can facilitate a paradigm shift in engineering education. This shift would involve a comprehensive integration of new technologies, cutting-edge pedagogical approaches, and a focus on cultivating problem-solving skills. The digital era demands graduates who have not only ring-in technical expertise but also the ability to adapt to rapidly changing scenarios and contribute meaningfully to innovation.

In getting the numbers right, the authors Gereffi et al. (2008) present a compelling reassessment of the engineering education landscape, challenging conventional wisdom regarding the quantitative comparison of engineering graduates across the United States, China, and India. Contrary to widely cited statistics, the authors highlight a narrower gap in the number of engineers produced in the United States compared to its counterparts. The article underscores the United States' continued prominence as a source of high-quality engineering talent globally. Moreover, it draws attention to potential challenges in China and India, where despite robust corporate demand for engineering services, concerns about substantial unemployment among recent graduates emerge, prompting a critical examination of the graduates' quality. The discussion extends to the implications for the United States, noting visa uncertainties and the increasing economic opportunities in engineers' home countries as factors complicating the attraction and retention of top talent from abroad. The article concludes with a pivotal assertion that the paramount concern in engineering education should shift from sheer quantity to the quality of graduates. Emphasizing the correlation between quality factors and their impact on innovation and entrepreneurship, the researchers advocate for a recalibration of priorities to ensure that

engineering education focuses on producing graduates equipped not just in quantity but with the skills and competencies that drive meaningful contributions to the global technological landscape.

In pursuit of fostering social equity, the Indian Government has implemented affirmative actions aimed at providing admission opportunities for "lower-caste" groups in engineering colleges. This well-intentioned policy has undergone scrutiny through a study conducted on affirmative action in education by Bertrand, Hanna and Mullainathan (2010). The research underscores a potential unintended consequence: the risk of exclusion for other marginalized groups, particularly women, seeking entry into engineering colleges. By highlighting this aspect, the authors prompt a critical examination of the broader impacts and intersectionality of affirmative action in the educational landscape. Furthermore, the authors present a nuanced perspective on the economic ramifications of this affirmative action. Their estimates reveal that while the policy generates income gains for the beneficiaries from lower-caste groups, it simultaneously results in income losses for displaced upper-caste candidates. This point of view adds a layer of complexity to the ongoing discourse around affirmative action, emphasizing the need for a balanced approach that considers the multifaceted impacts on various demographic groups within the educational system.

In a very detailed book titled “Profile of Engineering Education in India” by Biswas et al. (2010), the authors emphasize the challenges facing engineering education, addressing issues such as gender equity, regional imbalances, and compromised quality standards within the field. Despite a notable increase in the number of engineering

institutions nationwide, only 30% of women were enrolled in engineering programs at the time of the book's publication, highlighting persistent equity challenges. Additionally, there is an apparent regional disparity, with three out of seven regions holding 63% of engineering education seats. Factors like outdated curricula, inadequate infrastructure, and a shortage of qualified teachers compromise the quality of education. Efforts to improve quality through assurance, accreditation, and ISO certification are underway, but significant obstacles remain. The authors acknowledge proactive measures by AICTE but stress that addressing quality concerns necessitates sustained efforts, including competence development for teachers, incentivizing a career in teaching and research, and fostering collaboration between educational institutions, research labs, and industry. Achieving excellence requires a fundamental shift in the mindset of educational managers and policy planners.

In the insightful article by Rao (2014) on the future of engineering education in India, the author paints a comprehensive picture of the changes and challenges that future engineers are likely to encounter. Firstly, Rao emphasizes the unprecedented proliferation of knowledge, highlighting the exponential growth in information since the beginning of the century. This surge in knowledge demands a paradigm shift in the way engineers approach learning, requiring them to adopt continuous learning strategies to keep abreast of the rapidly evolving landscape of their respective disciplines. Moreover, Rao identifies technological developments as a critical driver in reshaping the engineering landscape. The increasing convergence of technologies across disciplines necessitates that engineers move beyond traditional silos and engage in interdisciplinary interactions. This convergence

underscores the importance of fostering a holistic understanding of various engineering domains, enabling engineers to navigate the interconnected world of emerging technologies effectively. Globalization emerges as another crucial factor shaping the future of engineering education. Engineers are now expected to possess cultural adaptability, given the global nature of competition for products, markets, and resources. The ability to work seamlessly in diverse, cross-cultural environments becomes a valuable skill, positioning engineers as effective contributors to international collaborations and initiatives. Rao also highlights the growing emphasis on environmental concerns and sustainability in engineering practice. The imperative for engineers to collaborate with nature and embrace green technologies reflects a paradigm shift towards a triple-bottom-line focus—Profit, People, and Planet. As companies increasingly prioritize sustainable practices, engineers must align their skills and innovations with eco-friendly solutions, addressing engineering and social challenges through an environmentally conscious lens.

Corporate Social Responsibility (CSR) is a critical consideration for future engineers. The article emphasizes the need for engineers to proactively think about and address the societal impacts of their work. Integrating CSR principles into engineering practices becomes a fundamental measure of success, urging engineers and organizations to be socially responsible contributors to the broader community.

Lastly, Rao underscores the importance of preparing engineers for abrupt changes in the socio-economic landscape. Factors such as terrorism, financial crises, war-like situations, and social upheaval have demonstrated the volatile nature of global events.

Engineers must equip themselves with the skills to anticipate, adapt to, and address these unforeseen challenges, fostering resilience and agility in their professional approach.

In summary, Rao's perspective on the future of engineering education in India emphasizes the need for a holistic and adaptive approach, equipping engineers with the skills and mindset necessary to navigate a rapidly changing and interconnected world.

In their insightful paper on engineering education by Mohan, Santosh and Sachin (2015), the researchers emphasize the pivotal role of ethics in the successful transition from school to work, marking the foundational step for a thriving career. The authors present a comprehensive review of engineering education, shedding light on the crucial stakeholders involved, ranging from regulators and college management to students and faculty. Each stakeholder group is recognized for its unique contributions and expectations, collectively shaping the development of both the institute and its students. Moreover, the paper provides thoughtful insights into how these diverse stakeholders can collaboratively contribute to making engineering education more engaging and entrepreneur-oriented. The emphasis is not only on technical proficiency but also on cultivating a mindset that aligns with the dynamic demands of the professional landscape. The authors underscore the ethical dimension, highlighting the importance of instilling moral values in engineering students. This ethical foundation is deemed essential for navigating the complexities of contemporary technologies and addressing industrial and societal needs responsibly. By incorporating ethical considerations into their education, aspiring engineers are better equipped to face the challenges of the professional realm, ensuring that their work aligns with both technological advancements and ethical imperatives. In conclusion, the authors

advocate for a holistic and ethics-driven approach to engineering education, recognizing the multifaceted contributions of stakeholders and the imperative of instilling ethical values in students. This perspective not only enhances the importance of engineering education but also prepares graduates to become responsible contributors to the technological and social fabric of the workforce.

Examining of the growth of engineering education in India Choudhury (2016) offers critical insights into the dynamics of expansion and inclusivity. Despite a noteworthy surge in the number of institutions and enrolment in engineering education following the post-liberalization era, the expansion has not translated into equitable access for disadvantaged groups, including women, scheduled castes, and scheduled tribes. This lack of equitable access raises concerns about the inclusivity of engineering education and the extent to which various segments of the population benefit from its growth. The study also delves into the financial dimensions of this expansion, revealing a decline in per-student expenditure. Despite the surge in enrollment, public spending on engineering education has not kept pace, leading to a financial strain on the sector. This decline in per-student spending highlights a potential challenge in maintaining the quality of education amid rapid growth. It emphasizes the importance of aligning financial resources with the expanding landscape of engineering education to ensure sustained development without compromising on educational standards. This economic aspect adds a layer of complexity to the expansion narrative, suggesting that sustained growth in engineering education requires not only an increase in the number of institutions but also a commensurate commitment to financial resources to maintain educational quality and inclusivity.

Technical faculty emerge as pivotal stakeholders in the school-to-work transitions of engineering students, as per a study by Mohanty and Dash (2016) on stakeholders. In the dynamic landscape of emerging job markets, there is a universal preference for challenging skills, particularly in science, technology, engineering, mathematics (STEM), statistics, and data analysis. This shift in skill demands aligns with the evolving nature of customer relationships and business strategies, where new models are emerging in the realms of education and commerce, catering to online consumers and learners.

To meet the demands that arise due to the changing landscape, effective professional development for both new and experienced engineering technical faculty becomes imperative. This need entails a comprehensive approach involving the redesign of curricula and pedagogy and the implementation of mandatory training in innovative teaching and learning methodologies. The goal is to equip technical faculty with the contemporary knowledge and skills to navigate the evolving educational terrain, ensuring they can effectively prepare students for the demands of the modern job market. This proactive stance toward faculty development acknowledges the critical role educators play in shaping the educational experiences that contribute to successful school-to-work transitions for engineering graduates.

In a study on alignment by Khare (2016), the author underscores the imperative for a radical shift in the approach of higher education in India to align with current industry needs. Several pressing areas warrant attention:

1. Formal vs. Non-formal Training: An excessive reliance on non-formal vocational training systems is identified, revealing a significant discrepancy between the skills

imparted by formal higher education institutes and industry expectations. Graduates, despite their formal education, often need more job readiness expected by the industry.

2. Educated Job Seekers vs. Placement Rates: The increasing percentage of educated job seekers does not correspondingly translate into higher placement rates. There exists a significant gap between the number of individuals seeking employment with educational qualifications and the actual placement outcomes from this pool.
3. Limited Professional Courses: The ratio of skilled to non-professional enrolment stands at 1:3, indicating a scarcity of professional courses relative to the overall enrolment. This scarcity emphasizes the need for a more balanced curriculum that addresses the demand for both experienced and non-professional skills.
4. Employability Skill Gaps: The problem of employability skill gaps is particularly pronounced among general academic non-professional graduates, who constitute the majority. Bridging these gaps is crucial for enhancing the market readiness of graduates and ensuring their successful integration into the workforce. Addressing these four areas requires a comprehensive reevaluation of higher education strategies and a realignment of curricula better to meet the demands of the evolving job market.

In a study by Pilz (2018), the author delves into the multifaceted landscape of school-to-work transitions in India, recognizing the intricacies posed by the evolution of the education system over the past seven decades post-independence. The study adopts a

nuanced approach, examining the challenges and opportunities at the macro, meso, and micro levels.

- Macro-level Analysis: At the macro level, Pilz explores the dichotomy between the educated and uneducated population, the dynamics of general versus vocational education, the contrast between structured and chaotic programs, the balance between supply and demand-driven approaches, and the interplay of public versus private financing. This panoramic view underscores the diverse factors influencing India's school-to-work transitions.
- Meso-level Examination: At the meso level, the study examines the adequacy of curricula, the duration of programs, and the competence of teachers and trainers. It highlights the critical role of a balanced and relevant curriculum, emphasizing the need for both short and long-duration programs that cater to the demands of the job market. Identifying competent teachers and trainers is essential for bridging the skills gap.
- Micro-level Insights: The micro-level analysis delves into the experiential aspect, contrasting theory-driven and practical learning experiences. The study also explores the balance between a teacher-centered and learner-centered approach, emphasizing the importance of a pedagogical strategy that aligns with the needs and expectations of the learners.
- Systemic Improvements: Pilz advocates for a multi-dimensional and interconnected approach to improving the governance and development of the Indian education system. The study warns against isolated initiatives and partial modifications,

emphasizing the potential risks of unforeseen side effects. Furthermore, Pilz stresses the importance of encouraging young researchers and fostering a scientifically sound approach to educational planning, positioning knowledge of both education and the labor system as essential components for informed decision-making.

In 2018, the All India Council for Technical and Engineering Education (AICTE), the regulatory body for engineering and management education in India, commissioned a study that resulted in the report "Engineering Education in India – Short & Medium Term Perspectives" by Mohan Reddy (2018). The report presented a critical assessment of the current state of engineering education in India, along with several recommendations to address the challenges. Here are some of the key recommendations from the report, rephrased for clarity:

- Diversification of Disciplines: The report proposed halting the approval of additional seats in traditional engineering disciplines with low capacity utilization, such as Mechanical, Electrical, civil, and Electronics engineering. Instead, institutions were encouraged to convert existing capacity in these disciplines to meet the demand in emerging fields like Computer Science and Engineering, Aerospace Engineering, and Mechatronics.
- Faculty Development Programs: In addressing the problem of poor employability among engineering graduates and the challenges faced by faculty, the report recommended implementing faculty development programs with a focus on new technologies. Emphasizing industry-focused visits for faculty and the mandatory

certification of education for educators, the proposal aimed to enhance the skills and qualifications of both students and faculty.

- Integration of MOOCs: To address the shortage of quality faculty, the report recommended allowing students flexibility in using Massive Open Online Courses (MOOCs) in their core and optional curricula. This measure aimed at supplementing traditional teaching methods with online resources.
- Industry Feedback and Technology Upgradation: The report stressed the importance of periodic industry feedback to facilitate technology upgradation in academia. It proposed measures to ensure that academic programs align with the evolving skill requirements of future job roles.
- Enhanced Industry-Academia Interaction: In order to improve the interaction between academia and industry, the report recommended utilizing analytical tools to comprehend teaching methods and integrate pedagogy with apprenticeships. It advocated for the rigorous implementation of mandatory apprenticeships, starting at 25% and gradually moving towards 100% over five years.
- Inclusion of Emerging Technologies: Acknowledging the growth of emerging, disruptive, and profound impact technologies like Artificial Intelligence (AI), Internet of Things (IoT), Blockchain, Robotics, and others, the report recommended incorporating these technologies into the curricula across disciplines. It also proposed the creation of new undergraduate engineering programs exclusively focused on these emerging technologies.

- Student-Centric Learning: The report emphasized a shift towards student-centric learning by encouraging design thinking and practical learning approaches. It urged exposing students to the application of technology in solving real-life socio-economic problems.
- Introduction of Open Book Examinations: The report recommended introducing open book examinations wherever applicable to promote higher-order cognitive skills.

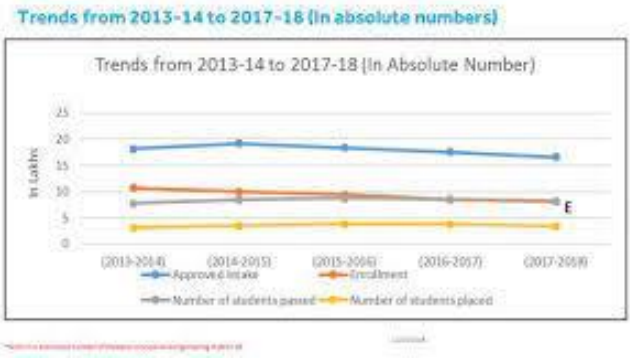

Figure 2.2: Engineering trends from 2013-14 to 2017-18 (Mohan Reddy, 2018).

These recommendations reflect a comprehensive approach to address the challenges in engineering education in India and align the curriculum with the needs of the evolving job market.

Delving into the dynamics of socio-economic representation within the realm of engineering education in India, Subramanian (2019) extensively explores this subject in the book "Caste of Merit". The author specifically sheds light on the intricate connection between the upper caste and the concept of meritocracy, unraveling insights gleaned from the experiences within the prestigious Indian Institute of Technology Madras (IIT Madras). The book comprehensively examines the historical trends and prevailing socio-economic

structures that have contributed to the dominance of certain caste groups, uncovering the nuanced interplay between caste dynamics and meritocratic ideals within the context of premier educational institutions in India. Ajantha's work serves as a critical examination of the intersectionality between caste-based privileges and the merit-based selection process, offering valuable perspectives on the socio-economic landscape of engineering education in the country.

Many early-career engineers need help transitioning from education to practice due to conflicts between expectations, habitual work practices, and workplace realities. The coming of 'Industry 4.0' or the 'fourth industrial revolution' emphasizes the need for students to develop enhanced socio-technical skills. While explicit curriculum reforms have not significantly improved employability, in a paper on transitioning engineering to practice by Trevelyan (2019), the author argues that assessment practices and curriculum gaps serve as an implied or hidden curriculum influencing student expectations and values. It proposes strategies to address these deficits in higher education institutions and workplace education interventions, aiming to equip engineers with abilities crucial for global productivity growth and economic transformation and addressing sustainability goals, particularly in developing countries.

Broadly, three sections categorize technical education in India: Institutes of Technologies (IITs), government-aided colleges, and crucial private colleges. IITs are recognized for providing quality technical education, while government colleges benefit from funds and infrastructure. Private engineering colleges, facing critical challenges, are often criticized for the quality of education due to limited resources caused by admission

constraints and fund generation issues. A study by Jayant Kulkarni (2020) to address these challenges proposed a comprehensive strategy to improve technical education in private colleges, addressing areas such as admission, teacher quality, management perspectives, research facilities, infrastructure, staff salaries, evaluation systems, placements, institute-industry interactions, and syllabi. Effective implementation will help to achieve tangible improvements in technical education, particularly in private institutions in India, including Maharashtra.

Envisioning colleges with the freedom to design their curricula independent of fee structures or unit constraints, Komives (2020) argues on the need for rebooting engineering education and anticipates a shift. Institutions led by proactive leadership inspiring faculty improvement through active learning and industry-focused projects will produce highly employable graduates. Conversely, those clinging to outdated strategies may dwindle due to waning student interest. Embracing a free-market approach, driven by colleges' success and graduate employability, aligns with the goal of closing low-quality institutions. This shift allows colleges to prioritize meaningful learning experiences over memorization, fostering analytical, evaluative, and design practices. Increased revenue enables higher faculty salaries, enhancing overall educational quality and appeal. Mentorship, rather than rigid benchmarks, can empower colleges to explore innovative strategies tailored to India's diverse student population, recognizing that one educational model does not fit all.

Aligning talent acquisition with long-term organizational goals is crucial, necessitating validation of talent sources in terms of diversity and practicality. A study by Krishnan, Sundar and Bhavani (2021) explores the impact of diverse student groups with varying

career priorities and backgrounds available for hiring in the domestic job market. The findings, based on the evaluation of hiring practices at various campus colleges, emphasize the need for tailored approaches. Among 250 campus hires studied over two years, a structured approach consistently targeting specific institutions and backgrounds yields better performance and employee stability compared to an unstructured hiring approach. This research advocates for strategic, customized campus hiring over-reliance on institutional ratings.

In the Indian context, the significance of engineering education and its direct correlation with students' career initiation has sparked considerable interest for multifaceted reasons. While engineering education inherently imparts knowledge and skills to students, a comprehensive study on enhancing employability skills for engineering students conducted on employability skills by Ajit et al. (2021) brings to light crucial insights. The study underscores a pressing need to prioritize real-project scenarios in training programs, emphasizing the practical application of the theoretical knowledge acquired—a dimension often found lacking in the existing curriculum.

Furthermore, the research accentuates the imperative of aligning the training curriculum with the individual career aspirations of learners, thereby bridging the gap between academic preparation and industry demands. The study emphasizes that improving skill quality should accompany a proactive approach in showcasing these acquired skills on resumes and degrees to enhance career readiness, thus promoting the development of transferable generic skills. According to the study's deductions, this proactive highlighting of skills becomes instrumental in positioning engineering graduates

as appealing candidates in the eyes of potential employers. In essence, the research positions a training paradigm that integrates real-world applications that align with career aspirations and emphasizes the strategic communication of acquired skills as a catalyst for ensuring successful and fulfilling career transitions for engineering students in India.

The success of an educational institute hinges on students' post-study achievements, whether through dream placements, admission to prestigious institutions, or entrepreneurial pursuits. A study by Pramod et al. (2021), spanning three academic years, gathers the aspirations of 2043 first-year undergraduate engineering students. The college that was studied has a five-stage model devised to nurture these aspirations to support those initially inclined toward multinational placements and higher education. Subsequent data reveals a significant shift in aspirations during the final year, with an increased focus on placements and a decline in those pursuing higher studies. A brainstorming session identified the factors influencing these shifts, providing valuable insights for academicians and institutions to align with student ambitions.

A provocative article by Jandhyala B. G (2021) on the Quality of Engineering education in India for its rapid expansion at the expense of quality, primarily assessed through institutional rankings, global standing, graduate employability, and attributes, brings a viewpoint of 7000 undergraduates across 48 public and private institutions in four engineering education dominant Indian states reveals a contrasting perspective. Surprisingly, a majority express satisfaction with their education, feeling adequately prepared for both the domestic and international job markets, as well as further academic

pursuits. These findings challenge researchers to adopt a broader approach, urging policymakers and administrators to reconsider their perspectives and actions.

The Indian constitution aims to provide quality education to all citizens, categorizing it into elementary, secondary, higher, adult, technical, and vocational education. With the liberalization era fostering privatization and internationalization, competition intensifies among engineering and technical institutions worldwide, including India. A one-of-a-kind study by Abdul Gani Ansar Ali (2023) addresses the critical role of campus placement in matching students' aspirations with job specifications, impacting both educational institutions and corporations. The study comprehensively explores multiple dimensions, encompassing engineering students' perspectives on placements, academic quality, infrastructure, and recruiters' assessments of potential; it also scrutinizes campus recruitment methods, influencing factors, students' competency levels, and the alignment of their employability skills with job specifications. The population studied comprises students from various engineering colleges in Coastal Andhra Pradesh.

Human resources provide a competitive edge for companies, as they consider not only production capacities but also unique human capital, which is challenging for competitors to replicate. Effective HR programs globally aim to minimize staff turnover, focusing on recruitment, selection, and retaining competitive advantages while preserving a positive work environment. Despite extensive studies on hiring and employee retention, the influence of talent acquisition on employee retention, particularly among engineering graduates, needs more attention. A research study by Agarwal (2023) conducted through a closed-ended questionnaire in thirteen IT companies in Meerut reveals a marked favorable

effect of talent acquisition practices on the retention of engineering graduates, indicating the potential for further exploration in this field.

Engineering education has been evolving from a teacher-centric to a student-centric approach. Outcome-Based Education (OBE) is pivotal, emphasizing student-centric learning to equip graduates with desired knowledge, skills, attitudes, and behaviors. The National Board of Accreditation (NBA) in India mandates OBE adoption, defining twelve Program Outcomes (POs) for professional programs. The study by Sumathi, Savithramma and Ashwini (2023) proposes a Curriculum Compliance Improvement Model (CCIM) for gap analysis in existing curricula. Addressing the challenge of achieving all twelve POs, the model suggests actions to enhance curriculum design and teaching processes. Tier-1 institutions aspiring for comprehensive graduate attributes can benefit from this model, aligning with accreditation objectives.

Making a case for the need for greater autonomy for engineering colleges to deliver effective faculty and student outcomes, a study by Gupta (2023) assesses the autonomy status of Indian engineering and polytechnic colleges, examining factors such as institutional autonomy, student placement, admission seat utilization, quality assurance implementation, and more. Based on responses from 752 participants via Google form, the descriptive research employs both qualitative and quantitative methods, utilizing purposive sampling to represent a diverse sample of engineering and polytechnic colleges in India.

A study by Govindaraj and Kandati (2023) delves into the intricate factors influencing the efficacy of such programs, employing a mixed-methods approach with surveys and interviews across diverse educational institutions and industries, emphasizing

the need for practical campus recruitment training for students entering the competitive job market. Findings reveal a nuanced interplay of elements impacting training success, including the training environment, content, schedule, and technological tools. This research throws light on the evolving nature of campus recruitment training, helps bridge the gap between academic and industry needs, and offers actionable recommendations for institutions and employers to optimize these programs.

2.8 Summary

Through the literature review, one can conclude that:

1. The research on the school-to-work transition has a vast scope, encompassing several dimensions, factors that promote and inhibit successful changes, country-specific nuances, the diverse angle of student experiences, and, finally, the influence of individual personality.
2. Research areas of interest in school-to-work transitions have evolved based on context and time, progressing from the sociopsychological difficulties of youth in the workplace to the identification of skills crucial for a seamless transition.
3. Government policies have played their part in facilitating effective school-to-work transitions and shaping the educational and vocational landscape.
4. Stakeholder engagement, particularly involving employers in the development of vocational courses and training, has proven crucial in preparing youth for the transition to the workplace.

5. Apprenticeships and internships, both part-time and full-time, have played a critical role in ensuring smooth school-to-work transitions, providing practical experience and skill development opportunities.
6. The absence of a universally agreed-upon theoretical definition of school-to-work highlights the need for ongoing discourse and collaboration among researchers to refine and evolve existing theories.
7. Addressing diversity, equity, and inclusion-related issues in school-to-work transitions requires broader considerations beyond a few dimensions, emphasizing the importance of a comprehensive approach.
8. The challenges faced by youth in achieving smooth and successful school-to-work transitions have evolved over the years in response to changes in the labor market and economy. Continuity of research is necessary to provide timely insights.
9. Engineering education in India has become a significant research interest due to policy changes, student motivations and preferences, market demands, and the surge in the number of engineering institutions. As engineering students form a lifeline for entry-level positions in India's booming Information Technology job market, studying school-to-work transitions in this category is essential for gaining insights that can enhance the overall school-to-work experience.
10. The role of Information Technology (IT)-specific job markets in India, heavily reliant on engineering graduates, underscores the need for in-depth research on school-to-work transitions within this category. Analyzing the unique challenges

and opportunities in this sector can provide valuable insights to improve the overall school-to-work experience for engineering students.

11. With technology continuously evolving and the demands of the global job market, ongoing research is crucial to staying abreast of the changing landscape of school-to-work transitions. Topics include examining how emerging trends, such as automation and artificial intelligence, impact the skill sets required for successful transitions.
12. The interplay between academic institutions and industry dynamics is a crucial aspect influencing school-to-work transitions. Investigating the collaborative efforts between educational institutions and businesses can shed light on effective strategies for aligning curriculum with industry needs and fostering smoother transitions for students.
13. International perspectives on school-to-work transitions add depth to the understanding of the subject. Comparative studies across countries can uncover best practices, policy innovations, and cultural factors that influence successful transitions, providing a holistic view that extends beyond national boundaries.
14. As educational systems worldwide adapt to new challenges and opportunities, exploring innovative models and practices in school-to-work transitions becomes paramount. Research should focus on identifying and disseminating practical approaches that enhance the relevance and applicability of education in the ever-changing job landscape.

15. It is essential to recognize the role of mentorship and guidance in school-to-work transitions. Research should delve into the impact of mentorship programs, both within educational institutions and in collaboration with industry professionals, to understand how mentorship contributes to successful transitions and long-term career development.

In summary, the comprehensive examination of school-to-work transitions encompasses diverse dimensions, from policy influences and stakeholder engagement to the specific challenges faced by engineering students in the IT job market. Continual research in these areas is essential to adapting to the evolving demands of the contemporary workforce and providing actionable insights for educators, policymakers, and industry leaders.

CHAPTER III:

METHODOLOGY

3.1 Overview of the Research Problem

A successful school-to-work transition is a multifaceted process that extends beyond mere employment and involves the seamless integration of education, skills development, and practical application in the professional world. It is characterized by a student, upon finishing their formal education at school or college, not just obtaining employment but also maintaining active involvement in meaningful work for an initial span of 3 to 5 years.

Several key elements contribute to the definition of a smooth or successful school-to-work transition:

1. Continuous Engagement in Paid Employment or Entrepreneurship
    - The transition involves the student actively participating in the workforce, either through traditional paid employment, self-employment, or involvement in a business venture.
    - This sustained engagement reflects the individual's ability to secure and maintain a position in the job market or to establish and manage their enterprise.
2. Avoidance of Unemployment Due to Lack of Skills
    - One crucial aspect of success is the ability to avoid unemployment resulting from a deficiency in the required skills for the chosen field.

- The student should possess the necessary competencies and adaptability to meet the demands of the job market, ensuring a smooth transition from education to employment.

3. Application of Knowledge and Experience:
    - Success is not solely measured by securing a job but also by the ability to apply the knowledge and skills acquired during their educational journey.
    - The transition is successful when the individual effectively utilizes their academic learning and practical experiences in real-world work scenarios.
4. Integration of Career Development and Lifelong Learning:
    - A successful transition includes a commitment to continuous career development and learning as the professional landscape evolves.
    - The individual should demonstrate a willingness to adapt, upskill, and embrace lifelong learning opportunities to stay relevant in their chosen field.
5. Personal and Professional Growth:
    - Success is not only defined by economic factors but also by the overall personal and professional growth of the individual.
    - The transition should contribute to the development of a well-rounded and skilled professional capable of navigating challenges and contributing positively to their chosen field.

In summary, a smooth or successful school-to-work transition extends beyond mere job placement and involves:

- the sustained engagement of a student in the workforce

- the application of acquired knowledge and skills
- a commitment to ongoing learning and development

It is a dynamic process that sets the foundation for a fulfilling and progressive career.

Studies such as Improving School-to-work Transitions by Neumark (2007), underscores the imperative of incorporating vocational education or courses into the academic curriculum to enhance school-to-work transitions. These studies advocate for a comprehensive approach that recognizes the practical skills gained through vocational training and equips students with both academic knowledge and hands-on expertise. This approach facilitates smoother transitions into the workforce.

In India, engineering stands as a popular choice among young individuals, primarily driven by the promising job opportunities in the Information Technology (IT) and IT-enabled services sector. Companies in these domains often exhibit a preference for graduates from circuit branches, including computer science, information science, electronics, electrical engineering, and instrumentation. This emphasis reflects the industry's demand for specialized skills in these areas. According to Statista (Statista Research Department, 2021a), in 2019, a substantial 3.2 million students were enrolled in various engineering disciplines. However, a concerning aspect is the unemployment rate among engineering graduates, which reached 46.58% in 2021, as reported by Statista (Statista Research Department, 2021b). This statistic underscores the challenges graduates face in translating their academic qualifications into gainful employment within the competitive job market.

The popularity of engineering courses is evident, yet the high unemployment rate among graduates signals a potential mismatch between academic training and industry demands, highlighting the need for a more nuanced approach to aligning educational curricula with the evolving needs of the job market.

Internships and School-to-work transition

The current study focuses explicitly on school-to-work transitions among engineering students in India, particularly those from the circuit branches. These students undergo a crucial phase of development through exposure to the industry facilitated by various forums and means. Colleges play a pivotal role in establishing connections with the industry through initiatives such as industry talks, conferences, panel discussions, industry expos, and designated industry days, along with offering a diverse range of internships. This exposure proves to be instrumental in shaping the students' understanding of the professional landscape and significantly influences their job search strategies. Notably, the study highlights a notable challenge faced by engineering students in India – the limited exposure to industry, as pointed out by Wilson and Deep Singh (2020). Despite theoretical and practical coursework, the deficiency lies in the availability of opportunities for industry internships, which are often limited to short (2 months) or long (6 months) assignments in the comprehensive 8-semester engineering course.

Hypothesis 1: Any short or long-term internship promotes smooth school-to-work transitions.

Academic Performance and School-to-work transition

A decline exists in the graduation-to-placement ratio, as noted by the researcher Neelam Pandey (2018), indicating a discrepancy between the number of students completing their studies and those securing employment. This trend underscores the persistent gap between the skills imparted by academic courses and the dynamic demands of the industry. Consequently, traditional metrics like academic performance no longer serve as reliable indicators for successful school-to-work transitions. The evolving job market necessitates a more comprehensive approach that aligns educational offerings with the evolving needs of industries to enhance students' employability and bridge the gap between academia and practical professional requirements.

Hypothesis 2: Only academic performance (better grades) without market-relevant training like internship may inhibit smooth school-to-work transitions.

Upon completion, this study should emphasize the necessity for two crucial reforms:

1. The implementation of mandatory internships in engineering colleges offering circuit branches is a practice that needs to be improved.

Shifting the focus of student orientation toward market skills and demands right from the commencement of their engineering courses rather than solely prioritizing academic performance, particularly for Indian engineering students.

3.2 Operationalization of Theoretical Constructs

Various research categories can be explored based on the chosen approach, such as quantitative, qualitative, mixed-method, nomothetic, and idiographic methodologies by Marczyk, DeMatteo and Festinger (2005). The literature survey in Chapter II revealed a

focus on school-to-work transitions in specific countries, comparative studies, diversity-related inquiries, and examinations of economic impacts. In the realm of engineering-based school-to-work transitions in India, existing research has delved into topics such as the employability of engineering students, the future of engineering education, and ethical considerations.

With a total population exceeding ten thousand engineering students (Statista Research Department, 2021a), this study concentrates on four engineering branches, encompassing individuals who graduated in 2013 and beyond. This timeframe aligns with the age group specified in the school-to-work transition framework established by the International Labor Organization (Elder, 2009a). The study's goal is to identify factors that facilitate or impede successful school-to-work transitions by establishing correlations between internships, academic achievements, and the students' perceived sense of success.

This research adopts a mixed-method approach, commencing with a quantitative method involving a survey distributed to a designated population. Following this, a qualitative approach employs in-depth interviews with stakeholders involved in student school-to-work transitions. Collected data sets undergo rigorous internal and external validity checks, aligning with Kothari's methodology (2004). The analysis serves to validate findings, significantly enhancing their credibility, and ultimately forms the basis for conclusive research outcomes. This dual-method strategy ensures a comprehensive exploration of the factors influencing school-to-work transitions, incorporating both quantitative survey data and qualitative insights from key stakeholders in the field.

3.3 Research Purpose

A successful school-to-work transition is pivotal for one's career trajectory. The landscape of engineering education in India is transforming, shifting from a perception of outdated education to one that is dynamic, progressive, and meets the evolving demands

of the job market. Given the substantial variations among engineering colleges in terms of admission procedures, popularity, demand, infrastructure, faculty qualifications, industry interface, exposure provided, and placement opportunities, there is a compelling need to investigate the factors influencing smooth school-to-work transitions.

This study aims to discern the elements facilitating seamless school-to-work transitions while shedding light on the factors that impede this process. By delving into these aspects, the research seeks to contribute valuable insights into the diverse factors influencing the journey from education to employment within the context of Engineering Education in India.

3.4 Research Questions

1. Which elements contribute to the smooth or successful school-to-work transition of engineering students in India?
2. What factors act as impediments to the smooth or successful school-to-work transition of engineering students in India?
3. How does the duration of internships (ranging from 4 weeks to 6 months) correlate with the success of engineering students in India in the school-to-work transition?
4. What is the relationship between academic performance (achieving 60%+ marks or a Cumulative Grade Point Average of 6.0 on a scale of 10) and the successful school-to-work transition of engineering students in India?

Several stakeholders influence school-to-work transitions. Here are a few:

Students: As students transition from school to work, their personality, job attitude, job search preparedness, and proactive engagement for support are pivotal factors

influencing the school-to-work transition. Beyond academic knowledge and skills acquired during college, the ability to swiftly demonstrate competence in a short selection process is crucial. Furthermore, the student's conduct on the job significantly contributes to the overall smoothness of the school-to-work transition, emphasizing the importance of behavioral aspects in successfully navigating this critical phase.

Family/Friends: A student's familial and social network, comprising parents, siblings, extended family, and friends, collectively exerts a substantial influence on the ultimate choice of employment following the completion of their education. Family members, being primary sources of support and guidance, contribute significantly to shaping the student's career decisions, offering advice, perspectives, and sometimes direct involvement in the decision-making process. Additionally, the influence of friends, who often share similar educational backgrounds or career aspirations, can play a crucial role in shaping the student's perceptions and choices regarding their first job post-school. This intricate web of relationships becomes a central determinant in the career trajectory, as the collective input from family and friends significantly impacts the student's decision-making process and ultimately shapes their post-school employment choices.

School/College/Institute staff: The educational institution a student attends plays a pivotal role in shaping the trajectory of their life. The institution's reputation and culture create an environment that significantly influences a student's choices, aspirations, and readiness to embrace challenges as they embark on their career journey. Factors such as the institution's history of placements, the efficacy of the placement department, the quality of training, industry exposure, available facilities, library and laboratory resources, faculty

support, and the dynamics of the peer group all contribute to shaping the student's experience and expectations. The institution serves not only as an academic foundation but also as a crucible for personal and professional development, where students draw inspiration and resources to surpass their expectations and launch into their chosen career paths with confidence and competence.

Employers: Employers establish their distinct brands through factors such as the clients they engage with, the products and services they offer, their domain expertise, the prevailing working culture, and the compensation structures they provide. In the realm of campus recruitment, colleges designate specific slots for employers based on various criteria, including the employer's industry standing and historical relationships. Simultaneously, employers are inclined to recruit from colleges based on their past experiences with students from these institutions, assessing their performance and compatibility with organizational requirements. This dynamic interaction creates a continual give-and-take, with colleges and employers influencing each other's choices. Colleges eager to enhance their students' opportunities may prioritize certain employers, while employers seeking the best talent may actively vie for favorable recruitment slots within educational institutions. This reciprocal relationship underscores the nuanced interplay between colleges and employers in the campus recruitment process.

Economy: The condition of the economy or its level of development is pivotal in shaping the job market, particularly concerning opportunities for fresh graduates. The business environment, intricately linked to economic growth, plays a crucial role in influencing a country's capacity to embrace and integrate technology. The overall

economic progress hinges on the augmentation of human capital, encompassing both physical and intellectual aspects. The multifaceted nature of economic growth is affected by an array of factors, ranging from financial and political dynamics to social, technological, administrative, and natural elements. The interplay of these diverse factors underscores the intricate web of influences that collectively shape the job market, illustrating the complicated relationship between economic conditions and the opportunities available to new entrants in the workforce.

Government Policies: Labor policies wield significant influence in the job market, serving as a linchpin in shaping the dynamics between labor supply and demand. Government initiatives, encompassing policies on education, skill development, and proactive strategies to cultivate skills aligned with future needs, can exert a transformative impact on the workforce landscape. Effective implementation of programs and infrastructure development geared towards building a skilled and adaptable workforce is crucial. By aligning educational and skilling initiatives with industry requirements, governments can bridge the gap between job market demands and the skills possessed by the workforce. In essence, well-crafted and executed labor policies become instrumental not only in responding to current job market needs but also in proactively preparing the workforce for the evolving demands of the future.

The objectives of the proposed research are:

1. To identify the factors that promote smooth school-to-work transitions.
2. To identify the factors that inhibit smooth school-to-work transitions

3.4 Research Design

To conduct a school-to-work transition survey, we will administer a questionnaire to a representative population identified using the International Labor Organization's School-to-Work Transition (SWTW) framework by Elder (2009c), with necessary modifications for our study. We will reach out to the population through college training and placement departments, urging them to share the survey in alum groups. The sampling methodology will adhere to the ILO SWTW framework by Elder (2009b). The survey's content will cover personal, family, and household details, followed by educational and activity history, as well as aspirational information, all structured according to the ILO framework. The survey serves as the cornerstone of our research design, aiming to gather comprehensive data on various aspects of individuals' transitions from education to the workforce.

Furthermore, stakeholders influencing school-to-work transitions, specifically parents and placement officers, will be interviewed using a structured questionnaire. As needed, the researcher will engage in telephone conversations with stakeholders to delve deeper into primary and secondary questions, gathering qualitative feedback. After collecting survey and interview data, the researcher will consolidate responses, employing analysis techniques, text mining analytics, and modeling to derive conclusive outcomes. It is essential to note that while the survey aligns with the ILO School-to-Work Transition (SWTW) framework, providing critical quantitative input, stakeholder interviews offer vital qualitative support data as called out by Elder (2010). Additional questions will be added in the survey, beyond the ILO framework, to capture nuanced insights into factors influencing the successful school-to-work transitions of the target population.

3.5 Population and Sample

To determine the population and sample for our study on school-to-work transition among engineering students, we must specify the age group of the students and identify the engineering colleges included in the research.

In the context of engineering admissions in India, the majority occur after students have completed the 10+2 education system. Across various education boards in Indian states, the minimum age for students to be eligible to write the Class 10 examination is 15 years. Consequently, the students will be at least 17 years old when they complete the 10+2 examination system and 21 years old upon finishing a standard 4-year engineering program. This minimum age consideration of 21 is particularly significant for the current research as it aligns with the age group targeted for school-to-work transitions, which spans from 15 to 29 years. While the completion of an engineering program is a primary criterion for inclusion in the study, the research will encompass all individuals who have graduated within the last few years, dating back to 2013.

Understanding the age dynamics is crucial for ensuring that the research captures the relevant population within the school-to-work transition-age bracket, shedding light on the experiences and trajectories of engineering graduates during the crucial post-education phase. The extended timeframe of nine years allows for a comprehensive exploration of patterns and trends, contributing valuable insights into the evolving landscape of school-to-work transitions for engineering students in India.

The National Institutional Ranking Framework (NIRF) is a methodology endorsed by the Ministry of Education, Government of India, designed to assess and rank higher education institutes across the country. The ranking parameters encompass teaching, learning and resources, research and professional practice, graduation outcomes, outreach and inclusiveness, and peer perception (Ministry of Education, 2021). For our study, we

will focus on the first 200 engineering colleges ranked by NIRF, considering them to be a comprehensive population. We will base the selection of colleges on the list available on the NIRF website, which the Ministry of Education sourced on the website (Ministry of Education, 2022). By concentrating on the top 200 NIRF-ranked engineering colleges, we aim to ensure a representative and inclusive examination of factors influencing school-to-work transitions among engineering graduates in India.

3.6 Participant Selection

To guarantee a diverse representation of colleges within the target population, we will examine the state-wise distribution of the top 200 NIRF-ranked engineering colleges. With 28 states and eight union territories in India, the table below includes information on 29 of these regions, specifying the number of engineering colleges within the top 200 rankings. This strategic approach aims to ensure a broad and varied data population, encompassing participants from across the country, contributing to the comprehensiveness and representativeness of the study.

Table 3.1: List of states and the number of engineering colleges in top 200 NIRF Ranking (Ministry of Education, 2022)

Indian State	Number of engineering colleges among NIRF 200
Andhra Pradesh	6
Arunachal Pradesh	2
Assam	4
Bihar	2
Chandigarh	2
Chhattisgarh	1
Delhi	7
Goa	1
Gujarat	6
Haryana	5
Himachal Pradesh	4
Jammu and Kashmir	2

Jharkhand	4
Karnataka	19
Kerala	4
Madhya Pradesh	8
Maharashtra	19
Manipur	1
Meghalaya	1
Odisha	9
Pondicherry	2
Punjab	10
Rajasthan	5
Tamil Nadu	36
Telangana	14
Tripura	1
Uttar Pradesh	14
Uttarakhand	5
West Bengal	6
Grand Total	**200**

Students specializing in the circuit branches, including computer science, information science, electrical engineering, electronics and communications engineering, electrical and electronics engineering, and telecommunication engineering, will be the target of the survey. For comprehensive coverage, we will distribute the survey to all graduating students in these branches. Our assumptions include the presence of a minimum of four circuit branches in each college and, within each branch, a class size of 60 students. This results in an estimated 240 students per batch. Considering eight batches from each college, our target survey population is 1920 students. Even with a modest 10% response rate, we anticipate garnering up to 192 survey responses per college. By approaching one college from each of the 28 states in India, our research aims to accumulate a substantial dataset exceeding 5000 responses, offering a robust foundation for detailed analysis and insights. This extensive dataset is vital for examining the school-to-work transition experiences of engineering graduates comprehensively and meaningfully.

3.7 Instrumentation

This research will gather data through a primary survey, initially reaching out to participants and later conducting interviews with a specific group of supporting stakeholders. Following the framework developed by the International Labor Organization (ILO) for country-wise school-to-work transition studies (Elder, 2009c), this study will incorporate additional and specific questions tailored to the current research. The online questionnaire, utilizing branching techniques, will be employed for participant responses. This is in contrast to the ILO framework where questionnaires will be manually administered with in-person interviews to capture data. This online survey approach is adopted to ensure the gathered data can seamlessly integrate into any future school-to-work transition studies conducted in India. By aligning with the ILO framework while incorporating research-specific inquiries, our methodology aims to provide a robust and adaptable foundation for the study of school-to-work transitions, facilitating consistent and comparative analyses over time.

Table 3.2: ILO – STWT – Framework – Questionnaire categories and number of questions (Elder, 2009c)

Category	Sub-category	Number of questions
Personal, family and household information	NA	20
Education, activity history and aspirations	NA	8
Education, activity history and aspirations	Work/study combination	5
Education, activity history and aspirations	Opinions and aspirations	7
Youth in Education	NA	7
Unemployed youth	Desire to work	1
Unemployed youth	Seeking work criteria	4
Unemployed youth	Availability criteria	1
Unemployed youth	Length of job search	1

Unemployed youth	Details of job search	15
Temporarily absent from work	Temporarily absent from work	3
Temporarily absent from work	Details of business or place of work	4
Temporarily absent from work	Personal work details	8
Temporarily absent from work	Voluntary or involuntary nature of hours worked	17
Temporarily absent from work	The job search	11
Temporarily absent from work	Employment status	1
Temporarily absent from work	Wage & salaried workers (employees)	4
Temporarily absent from work	Self-employed workers	8
Youth not in the labour force	NA	5

The online survey questionnaire for collecting primary data is designed with precision to facilitate quantitative analysis. It aims to gather data that will be instrumental in quantitative assessments of the school-to-work transition experiences of engineering graduates. Concurrently, we will source secondary data from review documents, journals, government websites, employment data, and existing research on engineering colleges in India. This comprehensive approach, combining primary and secondary data, ensures a well-rounded and detailed exploration of factors influencing school-to-work transitions. The survey's meticulous design aligns with the goal of obtaining specific and quantifiable insights from participants. At the same time, the incorporation of diverse secondary sources enriches the study with broader context and existing knowledge. This dual-data strategy enables a robust analysis, supporting a more comprehensive understanding of the dynamics surrounding the school-to-work transition for engineering graduates in India.

3.8 Data Collection Procedures

In the research process, the identified colleges will be contacted to obtain information about their alum students, clearly communicating the study's objectives. There will be a timeline by when if required responses are not received, the effort will be to reach out to students from these colleges through social media platforms such as LinkedIn. Additionally, there will be effort to initiate engagement with training and placement officers using information available on college websites. Simultaneously, parents/family members will be contacted based on alum students' data. This multi-pronged approach ensures a comprehensive outreach strategy involving colleges, students, officers, and family members. By directly communicating the study's objectives, the aim would be to foster cooperation and gather diverse perspectives on the school-to-work transition experiences of engineering graduates, enriching the data collection process with varied insights from different stakeholders.

Data will be gathered from the identified student population through an online survey/questionnaire. If the online survey does not yield sufficient data, the effort will be to conduct a set of 100 interviews with students. Additionally, there will be an effort to conduct a specified number of interviews with the training and placement officers of the colleges, and a survey with parents/family members of the students. This approach ensures a comprehensive data collection process, combining quantitative insights from the survey with qualitative perspectives obtained through interviews. The engagement with students, as well as college officers and parents, aims to provide a well-rounded understanding of the factors influencing school-to-work transitions among engineering graduates.

3.9 Data Analysis

Conducting data analysis constitutes a pivotal yet demanding phase of the research, requiring meticulous preparation and interpretation. The gathered survey data will undergo

comprehensive preparation, analysis, and interpretation as called out by Marczyk, DeMatteo and Festinger (2005). The study will specifically focus on identifying variables related to internships, academic performance, and success/satisfaction scores in current work. This analysis involves drawing correlations and testing hypotheses to unravel the intricate relationships within the dataset. While acknowledging the challenges and time-intensive nature of data analysis, this process serves as the essential linchpin, providing insights that underpin the research's core objectives.

3.10 Research Design Limitations

To fortify the validity and trustworthiness of this study, the researcher aims to construct the evaluation framework around critical criteria, including credibility, transferability, dependability, and conformability by Kothari (2004). This process involves establishing robust measures to ensure the study's internal consistency and reliability (credibility), its applicability to diverse contexts (transferability), its stability and replicability over time (dependability), and the neutrality and impartiality of the research process (conformability). Employing these criteria strengthens the methodological foundation, reinforcing the study's overall quality and ensuring the integrity of the findings.

Certain limitations exist, notably the influence of participants' personal biases shaped by their varied experiences—whether positive, negative, or neutral—during their school-to-work transition. These individual experiences may sway their responses in specific directions. However, it is assumed that the data collected from participants will embody honest and integral responses, free from bias. This assumption stems from the voluntary consent obtained for participation, underlining the commitment to sincere and unbiased contributions to the research.

3.11 Conclusion

This chapter provides an outline of the proposed quantitative research methodology. The study aims to glean insights into the factors influencing school-to-work transitions for engineering students in India. We thoroughly explore the justification and rationale supporting the study by employing a blend of qualitative and quantitative research methods. Primary and secondary data will be collected through questionnaires and surveys, serving as the principal mechanisms. Furthermore, we will scrutinize journals, literature, and books to validate and substantiate the findings, contributing to the robustness and reliability of the research outcomes.

CHAPTER IV:

RESULTS

4.1 Introduction

This chapter endeavors to comprehensively document the results of the survey conducted over ten months, with active participation from numerous respondents. The survey was electronically distributed through diverse platforms, including emails and LinkedIn, ensuring direct outreach to both the training and placement officers (TPOs) of engineering colleges and the participants. The engagement spanned multiple channels, facilitating a broad response from the targeted audience.

4.1.1 Recap of Research Objectives and Questions

This research aims to actively identify the factors that facilitate or hinder school-to-work transitions for engineering students in India. Chapter III, outlining the research methodology, establishes two hypotheses for this purpose. The first hypothesis posits that both short and long-term internships play a promotive role in ensuring a seamless transition from school to work. The second hypothesis contends that a focus solely on academic performance, marked by better grades, without concurrent market-relevant training, such as an internship, may act as an inhibiting factor in the smooth transition from school to work.

4.1.2 Brief Overview of Data Collection

The survey was crafted with careful consideration of the research requirements, aligning with the elements essential for the current study. Utilizing the country-specific school-to-work transition framework/survey guidelines from the International Labor Organization (Elder, 2009c), we structured the final survey to ensure its relevance and effectiveness in capturing pertinent data for the research.

After its preparation, the survey was emailed to training and placement officers from 30 colleges strategically selected across various states, with instructions to distribute it to student alum associations. Despite multiple reminders, the response rate remained low, with training and placement officers attributing the limited responses to the perceived lack of attention from alum students towards college emails. In response, the researcher explored alternative avenues to establish a more direct connection with students, aiming to convey the survey's significance and motivate participation.

Subsequently, the researcher utilized LinkedIn as the primary platform for conducting the research survey. Directly engaging with engineering students on LinkedIn proved effective in establishing a personal connection. This approach facilitated not only the request for survey participation but also provided an opportunity for participants to seek clarification on survey-related queries. The survey remained open for eight months, from February 2023 to October 2023, during which we approached over 2000 students directly on LinkedIn. Although 784 students attempted to participate, only 403 completed the survey. Upon reviewing responses based on passing year and engineering branch criteria, we identified 391 complete responses for further analysis.

This process allowed for a more active and personalized outreach strategy. The engagement on LinkedIn created a direct channel for communication, enabling participants to feel more connected and motivated to contribute actively to the survey. The eight-month duration of the survey provided ample time for engagement and responses, enhancing the overall effectiveness of the data collection process.

Despite initial challenges and the need to adapt the distribution approach, the direct connection established on LinkedIn proved instrumental in gathering responses. The strategy of directly approaching over 2000 students led to 784 attempts to participate. Although only 403 students completed the survey, their responses were considered

complete for thorough analysis after reviewing them based on the passing year and engineering branch criteria. This approach not only facilitated data collection but also ensured that the responses obtained were relevant and met the research criteria for further examination.

4.1.3 Structure of the Results Chapter

The remainder of this chapter follows a structured organization. It begins with descriptive data of the participants, proceeds to a focused examination of the variables associated with the hypotheses, and culminates in an endeavor to provide qualitative data of the survey as is.

4.2 Descriptive Data

4.2.1 Demographic Profile of the Participants

4.2.2.1 Age, Gender, and Geography

The demographic analysis of age and gender within the participant pool is crucial in unraveling the intricate dynamics of successful school-to-work transitions among engineering students in India. A significant majority, comprising 362 respondents, falls within the vital age range of 21-29, constituting a substantial 86.1% of the overall sample. Additionally, a smaller yet noteworthy group of 29 respondents (6.9%) falls within the 30-39 age bracket, providing additional insights into the transitional experiences of a more mature subset of participants.

In terms of gender distribution, the data underscores a prevailing gender gap within the engineering demographic. Specifically, 261 respondents (62.1%) identify as male, while 127 respondents (30.1%) identify as female. Notably, three respondents (0.7%) opted not to disclose their gender.

The participants' geographical distribution offers a nuanced perspective, with the majority, at 41.6%, originating from Urban Areas, totaling 172 respondents. Rural Areas

constitute a substantial 22.1%, representing 88 participants, while Semi-Urban Areas contribute 20.1%, encompassing 80 respondents. Metropolitan Areas are represented by 50 respondents, making up 12.1% of the sample. Intriguingly, a solitary respondent has a geographical background from another country. This detailed breakdown accentuates the significance of regional variations in educational experiences and subsequent transitions into the workforce. It underscores the necessity for nuanced insights into the interplay between geographical context and successful school-to-work transitions among engineering graduates in India. Recognizing the diverse origins of participants enhances the study's capacity to capture the complexities influenced by regional factors, enriching the overall understanding of the challenges and opportunities in the transition from academia to the professional realm.

Table 4.1: Age group, Gender, and Geography of participants (category: number)

Age		**Gender**		**Geography**	
30-39	29	Do not wish to disclose	3	Rural Area	88
21-29	362	Female	127	Semi Urban Area	80
		Male	261	Urban Area	172
				Metropolitan Area	50
				Another country	1
Total	**391**		**391**		**391**

4.2.1 Factors Influencing Transition Choices

4.2.1.1 Socioeconomic Status

The demographic data pertaining to family monthly income among engineering students in India, as unveiled in this research degree thesis, portrays a multifaceted economic landscape. The predominant segment, constituting 23.8% of the sample (101 participants), falls within the income bracket of > INR 125,000. Close in proportion, 21.5% of families exhibit a monthly income falling between > INR 50,000 and <= INR 75,000, involving 62 participants. Notably, 20.1% chose to keep their family's financial status

private, accounting for 53 participants. The subsequent income categories illustrate further nuances: 16.4% report a monthly income of > INR 75,000 and <= INR 100,000 (60 participants), 11% earn > INR 100,000 and <= INR 125,000 (40 participants), and 10.5% fall into the bracket of > INR 25,000 and <= INR 50,000 (57 participants). The smallest percentage, at 4.3% (18 participants), corresponds to families with a monthly income <= INR 25,000.

Understanding the economic diversity within the families of engineering students is instrumental in contextualizing the challenges and opportunities that impact their school-to-work transitions. The detailed analysis provides essential insights into the varied financial circumstances that influence students' educational journeys and subsequent entry into the workforce. This socio-economic backdrop becomes a pivotal lens through which to examine the intricate factors that contribute to or hinder successful transitions from academic pursuits to professional roles in the unique context of the Indian engineering education landscape.

4.2.1.2 Family Background

Understanding the demographic data on parental education is pivotal for gaining insights into the background of engineering students concerning successful school-to-work transitions in India. Analyzing the educational backgrounds of fathers, the majority, comprising 59.6%, have received University or higher education (255 respondents). Secondary school or less constitutes the academic background for 23.2%, involving 98 respondents, while 7.6% of fathers have had no schooling (18 respondents). Other educational backgrounds and Vocational Education represent 3.1% and 1.7%, respectively. Shifting the focus to maternal education, 52.7% of mothers have received University or higher education (207 respondents), followed by 36.1% with Secondary School or less (142

respondents) and 10.4% with no schooling (26 respondents). Other educational backgrounds and Vocational Education account for 3.3% and 0.8%, respectively.

The demographic data on parents' occupations among engineering students in India paints a diverse picture that contributes to the intricate dynamics of successful school-to-work transitions. Concerning fathers' occupations, the majority, comprising 66.8% of respondents, are employed (315 participants). Retired fathers constitute 13.9% of the sample (47 participants), while those not employed and deceased fathers account for 1.5% (5 participants) and 7.1% (24 participants), respectively. Mothers' employment status reveals that 42.4% of them are employed (179 participants), while 46.7% are not in any paid jobs (197 participants). Retired mothers constitute 3.3% (14 participants), and only 0.2% (1 participant) are deceased. Retired mothers make up 3.3% (14 participants), and only 0.2% (1 participant) are deceased.

This analysis sheds light on the significance of parental occupational dynamics in shaping the experiences and trajectories of engineering students. It forms a crucial foundation for the investigation into factors influencing successful school-to-work transitions in India. It underscores the varied roles that fathers and mothers play in terms of employment status, contributing valuable contextual information to the broader study of the transition from academia to the workforce.

Table 4.2: Income group, Parental education, and Parental occupation of participants (category: number)

Income group		Father's education		Mother's education		Father's occupation		Mother's occupation	
<= INR 25,000	18	No schooling	18	No schooling	26	Employed	315	Employed	179
> INR 25,000 and <= INR 50,000	57	Secondary School or less	98	Secondary School or less	142	Not Employed	5	Not Employed	197
> INR 50,000 and <= INR 75,000	62	University or higher	255	University or higher	207	Retired	47	Retired	14
> INR 75,000 and <= INR 100,000	60	Other	13	Other	13	Parent Deceased	24	Parent Deceased	1
> INR 100,000 and <= INR 125,000	40	Vocational Education	7	Vocational Education	3				
> INR 125,000	101								
No reponse	53								
Total	**391**		**391**		**391**		**391**		**391**

4.2.2 Educational Background of Engineering Students

4.2.2.1 Type of Engineering Programs & Academic Performance

In the landscape of engineering programs, the distribution of participant respondents based on their year of graduation paints a varied picture, capturing the evolving perspectives of engineering graduates in India. Notably, the majority of respondents completed their engineering degrees in recent years, with the highest percentage graduating in 2021, comprising 26.2% of the sample (110 participants). The subsequent year, 2022, closely follows, representing 19.5% of respondents (82 participants). An intriguing observation emerges with the year 2020, standing out prominently and accounting for 19.2% of the respondents (81 participants). These recent graduation years play a crucial role in shaping the study's exploration into the factors influencing successful school-to-work transitions, providing a contemporary lens to understand the experiences of engineering graduates in the dynamic Indian job market.

Conversely, the earlier years, ranging from 2013 to 2019, exhibit a gradual increase in participant numbers. This temporal distribution lends context to the changing landscape of engineering education over the years. It underscores the importance of considering varied vantage points to comprehend the nuanced challenges and opportunities encountered by graduates as they traverse the transition from academic institutions to professional careers.

The majority of participants, constituting 96.4%, are enrolled in Bachelor's programs (B.E/B.Tech), with 377 respondents forming this predominant cohort. In contrast, a minor faction of 14 respondents, or 3.3%, are pursuing Master's programs (M.E/M.Tech). This distribution highlights the prevalent focus on undergraduate engineering education among the study's participants.

Turning to academic achievements, an overwhelming 88.7% of the participants, totaling 374 individuals, completed their studies with an impressive grade of >=60% or a CGPA of 6 out of 10. This high level of academic proficiency reflects the dedication and

competence of the cohort. Conversely, 17 respondents (4%) concluded their programs with a grade of <60% or below 6 CGPA.

The research is confined to a specific set of engineering branches collectively known as "circuit" branches, focusing on the unique dynamics within this academic subset. A detailed examination of the data pertaining to the engineering branches from which respondents graduated reveals a rich tapestry of educational backgrounds. A predominant 41.7% of respondents completed their studies in the Computer Science branch (187 participants), showcasing its significant prevalence within the sample. Following closely, the Electronics and Communication branch represents 28.3% of respondents (127 participants), further underlining its noteworthy presence. Additionally, the Electrical and Electronics branch constitutes 5.6% (25 participants), with Information Science and Electrical Engineering contributing 5.1% (23 participants) and 2.5% (11 participants), respectively. Specialized branches like Instrumentation, Telecommunications, Information Technology, and Electronics Engineering each contribute smaller percentages ranging from 0.9% to 1.6%. Furthermore, a few respondents graduated from more niche branches such as Computer Technology and Entrepreneurship, Data Science, and Electronics and Computer Engineering, each representing a 0.2% share.

This diversified array of engineering branches within the sample not only reflects the heterogeneous academic landscape but also adds depth to the study's exploration of school-to-work transitions within the specific context of circuit branches in engineering.

Table 4.3: Year of passing, engineering course, academic performance, breach of engineering of participants (category: number)

Year of Passing		Engineering Course		Academic Performance		Branch of engineering	
2013	5	B.Tech/B.E	377	Completed with <60% or 6 out of 10 CGPA	14	Computer Science	187
2014	16	M.Tech/M.E	14	Completed with >=60% or 6 out of 10 CGPA	377	Electronics and Communication	127
2015	10					Electrical and Electronics	25
2016	13					Information Science	23
2017	14					Electrical Engineering	11
2018	29					Instrumentation	7
2019	31					Telecommunications	4
2020	81					Information Technology	**3**
2021	110					Electronics Engineering	1
2022	82					Computer technology and entrepreneurship	1
						Data science	1
						Electronics and computer engineering	1
Total	**391**		**391**		**391**		**391**

4.2.3 Transition Pathways

The prevailing trend among engineering students is to actively participate in campus placements as a pathway to secure employment. However, an analysis of available AICTE data from 2022 indicates that only 58% of these students successfully secure placements (AICTE, 2022). It is noteworthy that this statistic reflects the percentage of students who manage to secure jobs through the campus placement process.

4.3 Employment Outcomes

The data underscores the significance of obtaining employment within the initial year post-graduation, a pivotal element for a seamless career transition. Notably, 54.4% of respondents, amounting to 237 individuals, successfully secured employment within this timeframe. In contrast, 13.1% conveyed that they did not secure a job within the first year, representing 18 participants. Intriguingly, a substantial proportion, constituting 32.5%, refrained from responding to this specific inquiry, encompassing 136 participants. This nuanced breakdown emphasizes the diverse outcomes in terms of immediate employment experienced by engineering graduates, underscoring the considerable variability in their early career trajectories.

The varied responses within this dataset lay the groundwork for a comprehensive exploration of the multifaceted factors influencing successful school-to-work transitions

within the Indian educational landscape. The examination of these diverse employment outcomes offers valuable insights into the intricate dynamics that contribute to or hinder the effectiveness of the transition from academia to the professional realm for engineering graduates in India.

The data on the number of job changes since completing their courses sheds light on the diverse career trajectories of respondents. Many participants, accounting for 55.5%, reported experiencing just one job change since graduation, with 242 individuals falling into this category. Another notable group, constituting 14.3% of respondents, indicated that they had undergone two job changes, totaling 62 participants. Furthermore, 10.6% of participants reported navigating three job changes (29 individuals), while a smaller percentage of 2.3% had experienced four job changes (10 participants). Interestingly, only 0.2% of respondents had undergone five job changes (1 participant). Intriguingly, 10.8% of respondents chose not to respond to this question, comprising 47 participants.

The data regarding the current job domains of respondents paints a picture of a highly diversified professional landscape. The most significant portion of participants, constituting 42.8%, finds employment in the Consulting domain, with 188 individuals engaged in this sector. Technology comes in second, with 7.7% of respondents working in technology-related roles, totaling 34 participants. Other domains collectively make up a modest 0.9%, with four participants dispersed across various sectors. Specific areas such as Customer Service, Logistics, and HealthTech each contribute 0.5%, represented by two participants in each category. Banking and Financial Services account for 0.7% (three participants), while EdTech and Education each contribute 0.5%, with one participant each. E-commerce and Creative Design and Branding together make up 0.9%, featuring four participants in these domains. Notably, a significant portion of participants, comprising

33.6%, left the question about their current job domain unanswered, totaling 148 participants.

4.4 Internships & Job Satisfaction

The data concerning engineering college internships provides insights into the prevalent engagement of students in practical training experiences, which significantly contributes to their employability. A substantial majority of respondents, accounting for 69.1%, reported having participated in internships during their academic course, totaling 270 participants. In contrast, 30.9% of respondents, comprising 121 individuals, indicated that they did not have internship experiences. This descending order breakdown highlights the widespread availability and participation in internship opportunities throughout the academic journeys of the surveyed engineering students.

The data regarding the types of engineering college internships underscores the varied engagement patterns among respondents. A significant proportion, constituting 35.5% of participants, reported participation in summer internships lasting for two months (135 participants). Concurrently, 23.7% of respondents opted for semester internships, spanning a more extended period of six months, totaling 91 participants. Moreover, a noteworthy 13.5% of participants embraced a combination of both summer and semester internships, demonstrating a nuanced exposure to diverse work environments (33 participants). In addition to these prevalent patterns, a smaller fraction, accounting for 3.2% of respondents, pursued other types of internships (11 participants).

This comprehensive breakdown elucidates the diverse nature of internship experiences among engineering students, shedding light on the varied durations and formats chosen by respondents. Such nuanced insights provide a valuable understanding of the multifaceted aspects that contribute to their preparedness for successful transitions from academia to the professional landscape.

One hundred ten respondents reported that they did receive a stipend during the internship.

The data pertaining to the contents of engineering college internships provides a nuanced insight into the diverse elements encompassed within these experiential learning opportunities. Respondents engaged in a wide array of internship activities, with a majority participating in project-related training (68 participants) and shadowing of work (61 participants). Significantly, a substantial number of participants were actively involved in project and product development work (57 participants), indicating hands-on experience in real-world engineering projects.

Moreover, the internships incorporated components aimed at fostering holistic development, including Soft Skill Training (50 participants), Campus-to-Corporate Transition Sessions (45 participants), and Internal Projects (39 participants), emphasizing the importance of both technical and soft skills. Participants also gained exposure to Case Studies (38 participants), benefitted from Mentorship (27 participants) and Coaching (22 participants), and engaged in Research-Related Work (18 participants). This diverse landscape underscores the richness of internship experiences, contributing to the multifaceted development of engineering students and enhancing their preparedness for successful transitions into the professional sphere.

Hypothesis 1 of this research aims to scrutinize the correlation between internships and their potential role as promoters in the school-to-work transition. Examining the data on respondents' agreement levels regarding the impact of internships on securing a job reveals a spectrum of perceptions. A substantial portion, accounting for 36.9%, strongly agrees that internships significantly facilitated securing employment (64 participants). Moreover, a noteworthy 23.1% agreed with this statement (97 participants).

Within the sample, 13.8% neither agree nor disagree (58 participants), while a smaller segment, constituting 5.3%, disagrees with the notion (25 participants). Among the respondents, 3.3% (14 participants) expressed strong disagreement. Notably, 2.8% still need to respond to this question (12 participants).

Job satisfaction is a pivotal aspect influencing individual careers, both during and after school-to-work transitions. Analyzing the data on job satisfaction levels among respondents uncovers a diverse spectrum of sentiments. A considerable 46.5% of participants expressed satisfaction with their current employment, with 42.6% indicating satisfaction (199 participants) and an additional 3.9% being very satisfied (90 participants). Conversely, 11% of respondents expressed dissatisfaction, with 9.5% being dissatisfied and 1.5% very dissatisfied, totaling 10 participants.

A substantial portion, constituting 20.9%, neither affirmed nor denied job satisfaction (44 participants), while 19.9% did not respond (47 participants). This nuanced range of satisfaction levels among engineering graduates provides valuable insights for the study's exploration of factors contributing to or inhibiting successful school-to-work transitions in the Indian context. The findings underscore the multifaceted nature of job satisfaction experiences, shedding light on the complex interplay between various factors influencing the career contentment of engineering professionals in India.

4.5 Internship and Job-seeking

Observing the correlation between participating in internships and the subsequent likelihood of securing employment within one year of completing an engineering course is not just advisable but imperative for several compelling reasons. The data obtained in this study provides a robust foundation for this argument. A striking 86.1% of respondents, constituting a significant majority, reported successfully securing employment within the first year (237 participants). This data point stands in stark contrast to the 7.8% who did not guarantee a job

within this timeframe (18 participants), emphasizing the marked difference in outcomes for those who engaged in internships. Furthermore, the fact that 6.8% did not respond to this inquiry (15 participants) does not diminish the compelling nature of the association observed.

4.6 Academic Performance & Job-seeking

The survey results and data support the hypothesis positing a correlation between academic performance, explicitly achieving a grade of >=60% or a CGPA of 6 out of 10, and the absence of internship participation in relation to job placement within one year of completing the engineering course. The analysis reveals a noteworthy statistic where 100% of respondents have not responded to the job placement question (114 participants) in this specific context. This outcome strongly suggests a significant correlation between academic excellence without internship engagement and a lack of success in securing employment shortly after graduation.

4.7 Other Job-seeking Avenues

The survey queried participants about specific courses and factors contributing to their employment within the first year after completing an engineering course. The data on the combination of courses influencing job placement emphasizes the importance of diversified skill sets. Proficiency in Programming Languages (e.g., Python) is given as a critical factor in securing employment (68 participants) by a significant proportion of respondents, constituting 29.5%. Notably, 13.6% highlighted the combination of Full Stack Development and Programming Languages (e.g., Python) (25 participants). Other notable combinations include Programming Languages (e.g., Python) and Website Development (9.6%, 18 participants), Full Stack Development, Programming Languages (e.g., Python), and Website Development (9.1%, 17 participants), and Full Stack Development (7.5%, 14 participants).

Furthermore, combinations such as Data Science and Programming Languages (e.g., Python) have supported securing jobs for 4.8% (11 participants). In comparison, Full Stack

Development and Website Development (4.3%, 10 participants) and DevOps (4.3%, 10 participants) also contributed to the skill sets deemed beneficial for job placement. More advanced combinations involving Artificial Intelligence, Programming Languages (e.g., Python), Machine Learning or Full Stack Development, Programming Languages (e.g., Python), Website Development, and Machine Learning were the courses that helped smaller percentages of participants (2.6%, 6 participants, and 1.7%, 4 participants, respectively). This data reveals the diverse skill sets that engineering graduates consider instrumental in securing employment within the first-year post-course completion, offering valuable insights for educational institutions and policymakers in shaping curriculum strategies aligned with industry demands.

The data elucidating factors that facilitated participants in securing employment within one year of completing their engineering course provides insights into the nuanced landscape of employability. A substantial 44.9% of respondents attribute their success to the skills and knowledge directly acquired from their college courses (152 participants). Project work undertaken during their academic tenure also emerges as a pivotal factor, with 28.9% of participants underscoring its significance (98 participants). Soft skills, recognized as essential for professional success, contribute significantly, representing 17.4% of respondents (59 participants).

A smaller yet noteworthy percentage, 5.3%, acknowledges the role of personal connections, such as family and friends, in securing employment (18 participants). Interestingly, a mere 1.5% attribute their job placement to general knowledge acquired outside the formal college curriculum (5 participants).

4.8 Covid-19 Impact

The data regarding the impact of COVID-19 on students' school-to-work transition or careers highlights the widespread influence of the global pandemic on the professional

trajectories of engineering graduates. A significant 35.8% of respondents affirm that their transition or career was affected by the pandemic (142 participants). In contrast, 57.2% of respondents indicate no such impact, suggesting a substantial number of students who managed to negotiate well the challenges posed by the unprecedented circumstances (215 participants). Notably, 8.5% of participants did not respond to this question (34).

This data breakdown reveals that a considerable portion of engineering students encountered disruptions and challenges in their school-to-work transition due to the far-reaching effects of the pandemic.

The data on how COVID-19 specifically impacted students' school-to-work transition or careers provides a nuanced understanding of the challenges faced by engineering graduates. The majority of respondents, constituting 28.5%, reported minimal or no impact on their transition or career due to the pandemic, suggesting a level of resilience among a significant portion of students (114 participants). However, a substantial 25.3% highlighted a decrease in campus placements compared to usual years, indicating a direct impact on traditional avenues for job acquisition (101 participants).

For 20.1% of respondents, skill and knowledge building through college courses slowed down due to the shift to online learning, affecting the usual pace of academic development (80 participants). The lack of in-person connections impacted 17.4% of respondents, with some still recovering from this setback (69 participants). Remote work-induced stress affected the well-being of 17% of participants (68 participants), while the absence of in-person interaction significantly impacted 15.6% of respondents in securing paid work (62 participants). Additionally, 15.6% did not respond to this question (62 participants).

Other impacts included delayed job acquisition despite preparedness, family responsibilities due to COVID-19, challenges in coping with oneself induced by COVID-

19, and job loss due to downsizing or closure. This data illustrates the multifaceted ways in which the pandemic has affected engineering students' school-to-work transitions, emphasizing the need for comprehensive support systems and strategies to navigate the evolving challenges in the post-pandemic professional landscape.

4.9 Family Member Survey

To gain a fresh and different perspective, the researcher surveyed in December 2023, targeting family members who supported engineering students in their transition from school to work. This section presents insights derived from the collected survey data.

Out of 40 received responses, 23 were deemed eligible for inclusion after a thorough review for completeness. Given that this sample represents approximately 5% of the total students responding to the primary survey on school-to-work transition, data presentation will be in percentages. Here are the key findings:

- **Demographics of Family Respondents:** 87% were fathers, with the remaining respondents being mothers, brothers, and uncles.
- **Graduation Years of Students:** 35% graduated in 2016, followed by 17% in 2022, 13% in 2019, and 9% each in 2013 and 2017.
- **Field of Study:** 35% of students completed computer science/engineering, with an equal percentage completing electronics and communication. The rest were from other circuit branches.
- **Primary Goals of Engineering Education:** 61% of students aimed for placement in reputed companies, while 13% focused on gaining skills and knowledge. Other goals included pursuing higher education abroad or in India and using engineering as a base qualification for an MBA.
- **Preparation and Information:** 91% of family members felt adequately informed about the prospects of an engineering degree before their wards pursued the course.

- **Support Mechanisms for School-to-Work Transition:** 48% mentioned career counseling as the most helpful, followed by 26% citing internships. Other supportive factors included resume-building, networking events, and workshops.
- **Post-Engineering Outcomes:** 74% reported their wards securing paid work within a year, while others opted for higher education.
- **Challenges Faced by Graduates:** Challenges included mediocrity at work, the dilemma of further studies or job stability, changing jobs for better pay, and a lack of market-relevant skills.
- **Challenges Faced by Family Members:** Challenges included students' lack of career focus, the family's limited engineering knowledge to share, financial constraints, and inadequate motivation from college faculty.
- **Satisfaction Levels:** 43% were satisfied, 43% were neutral, and 13% reported dissatisfaction with their wards' school-to-work transition.
- **Need for a Comprehensive Resource Portal:** An overwhelming 65% expressed a definite need, while 22% indicated a probable need. Nine % were unsure, and the rest saw no need.
- **Open Comments:** Respondents highlighted the need for career counseling in schools, improved job-specific technology training, soft skills development, practical workplace exposure, and dynamic alignment of institutions to market needs.

4.10 The TPO Interviews

Training and Placement Officers (TPOs) play a crucial role in shaping the careers of engineering students by facilitating connections with top-tier companies during campus placements. TPOs enable students to secure their desired jobs and kickstart their professional journeys. Interviews with ten TPOs helped gain insights into the dynamics of

school-to-work transitions in engineering colleges. The discussions covered various aspects of the transition from academia to the corporate world. These interviews were conducted anonymously, with the consent of the TPOs to publish their responses.

Among the ten TPOs interviewed, two represented government engineering colleges, while the remaining eight were from private engineering colleges. The selection aimed to capture a diverse range of perspectives, considering factors such as college rankings according to the 2022 NIRF rankings. The interviewees included representatives from colleges ranked below 50, between 51 and 100, and between 101 and 200. Additionally, one college, not ranked in the NIRF, was also included to ensure a comprehensive representation of different institutions. Notably, one of the interviewed colleges was a women's campus, further adding to the diversity of perspectives.

Geographically, the TPOs represented a mix of colleges from northern and southern India. Three colleges are from the north of the region, while the remaining seven are in the southern part of the country.

Given their pivotal role, TPOs are considered key stakeholders in the school-to-work transition process for engineering students in India. The interview questions delved into a range of topics, from the TPOs' perspectives on placement satisfaction in their colleges since 2013 to the challenges they have encountered and the strategies employed to address them.

Question 1: What is your overall satisfaction with the effectiveness of campus placements since 2013? (Very Satisfied, Satisfied, Neutral, Dissatisfied, Very Dissatisfied)

Summary of Responses: Every Training and Placement Officer (TPO) interviewed acknowledged a consistent upward trajectory in campus placements at their respective colleges since 2013. Notably, they conveyed overall satisfaction with the quantity of placements. Interestingly, three TPOs highlighted a notable shift in the nature of

placements, moving from the traditional focus on Information Technology (IT) Service companies to an increased emphasis on placements related to IT Products.

Furthermore, one TPO raised concerns about a need for more fundamental knowledge among students post-2018. This deficiency was attributed to a lack of student interest in certain subjects, posing a significant challenge for those securing jobs through campus placements. The TPO's observation underscores an emerging issue where students may need help with job performance due to a gap in fundamental knowledge despite securing positions.

Question 2: Which three factors do you believe have contributed to the success or failure of campus placements? (Quality of student preparation, Industry Demand, College Networking, Placement cell effectiveness, Alumni Support, Other)

Summary of Responses: In the responses provided by all ten Training and Placement Officers (TPOs), the Quality of Student Preparation emerged unanimously as one of the three pivotal factors contributing to the success of campus placements. Notably, six out of the ten TPOs identified College Networking as a crucial element influencing student placement success. Additionally, Alumni Connect was recognized by four out of the ten TPOs as one of the top three factors contributing to placement success.

Moreover, TPOs highlighted Industry Demand and the Effectiveness of the Placement Cell as two other key factors that have played integral roles in enhancing placement outcomes. Collectively, these factors represent the multifaceted and interconnected elements of campus placements that contribute to their effectiveness.

Question 3: How would you describe the overall trend in campus placements at your engineering college since 2013?

Summary of Responses: Every Training and Placement Officer (TPO) unanimously attested to a consistent growth in placements from 2013 to 2022. Notably,

one TPO highlighted that the year 2022 witnessed an all-time high in placements within their college, signifying a remarkable achievement.

In addition, one TPO reported a notable shift in the professional trajectories pursued by engineering circuit branch students. This change encompassed a diversification of roles beyond the conventional engineering domain, with students venturing into areas such as sales, marketing, coaching, tutoring, and business development. This shift reflects an evolving trend in the career choices of engineering students, demonstrating their adaptability and willingness to explore diverse fields beyond traditional engineering roles.

Question 4: Can you provide an overview of the total number of companies participating in placements each year and how it has evolved?

Summary of Responses: Over the years, the leading recruiters for circuit branch engineering students have transformed, transitioning from a focus on IT Services, Products, and Consulting companies to an expanded array of sectors. Notably, there is now a prominent recruitment presence from start-ups, fintech, investment banking, Edutech, and health tech companies.

In terms of the scale of recruitment activities on campus, the diversity is striking. Three Training and Placement Officers (TPOs) reported an impressive range of 80-100 companies participating in recruitment drives on their campus. Another two TPOs surpassed this, with 150-200 companies actively engaging in the recruitment process at their respective colleges. Furthermore, three TPOs witnessed an even higher magnitude, with approximately 300+ companies visiting their campus for recruitment. Notably, one TPO stood out with a vast number, reporting over 600 companies, including some from overseas, actively participating in recruitment activities on their campus. This diverse recruitment landscape underscores the broad spectrum of opportunities available to circuit branch engineering students across various industries and geographies.

Question 5: Have you observed any significant changes in the sectors or industries participating in campus placements over the years?

Summary of Responses: All Training and Placement Officers (TPOs) uniformly conveyed that there has been a notable expansion in the sectors actively recruiting from their campuses, extending beyond the traditional domains of IT Service and Product companies. This diversification includes increased participation from consulting, banking, core engineering, automobile, chemical, healthcare, and manufacturing companies.

Moreover, two TPOs highlighted a burgeoning trend in specialized startups focusing on Artificial Intelligence, Machine Learning, Cybersecurity, and Cloud technologies actively visiting their campuses. This trend reflects the evolving landscape of recruitment, with a surge in demand for skills in cutting-edge fields.

One of the TPOs reported an exciting development: the emergence of government and public sector entities participating in campus recruitment, marking a noteworthy shift in the sources of employment opportunities for students.

Additionally, another TPO reported a unique trend, where roles involving construction project status reporting through remote image analysis have become prevalent. Furthermore, this TPO noted that major conglomerates are establishing their data centers in India, creating new avenues for employment in data center management through campus recruitment. These varied trends underscore the dynamic and expansive nature of opportunities available to students beyond traditional sectors.

Question 6: Can you highlight some challenges or obstacles faced by your students in the placement process and how the college has addressed them?

Summary of Responses: Each Training and Placement Officer (TPO) identified distinct challenges encountered in the realm of campus placements. Notably, one TPO addressed the prevalent issue of students lacking adequate preparation for coding tests, a

concern increasingly common among campus recruiters. To tackle this, the TPO team is actively engaged in coaching students, employing training programs and tools to enhance their coding skills.

Another TPO reported a significant challenge arising post-2018, wherein students exhibited a lack of seriousness, which in part was attributed to financial support received from the government. In response, efforts are underway to instill a more dedicated approach to academics and career readiness among students.

Additionally, a TPO highlighted communication skills as a notable issue, particularly among students hailing from Tier 2 cities. The TPO mentioned that to address this issue; there is an initiative to provide early training in spoken English and communication skills to better equip students for professional interactions.

Furthermore, another TPO discussed the rising trend of companies expecting pre-trained resources as part of campus recruitment, leading to a shift in the responsibility for job-specific training to the college itself.

One TPO raised the concern of campus corruption, where direct engagement between college promoters and recruiters interferes with the placement process, bypassing qualified professionals in charge of placements.

The challenge of students holding multiple offers was emphasized by one TPO, indicating that delayed decision-making impacts opportunities for other students. The abundance of on-campus, off-campus, and public recruitment avenues, including coding challenges like hackathons, contributes to this complex scenario.

Lastly, a TPO sheds light on challenges related to the timing of campus recruitment by certain product companies, insisting on participation from all students. Additionally, there was an issue where competing companies approached students directly for hiring

outside the established campus process, posing a challenge to fair and organized recruitment practices.

Question 7: How have changing industry trends influenced the types of job opportunities available for your engineering graduates?

Summary of Responses: All Training and Placement Officers (TPOs) unanimously acknowledged a shift in the landscape of job opportunities driven by prevailing industry trends. Among the reported changes, five out of ten TPOs highlighted a transformation in the types of roles sought by companies. This evolution encompasses positions such as Business Analyst, Risk Analyst, Front End Developer, Back End Developer, Full Stack Developer, Cloud Engineer, Data Engineer, Data Scientist, Machine Learning Engineer, Artificial Intelligence Engineer, and IoT specialist. This change marks a departure from the previous norm of primarily offering the singular role of Software Engineer Trainee.

Furthermore, a TPO spoke about a distinct change, wherein companies expressed a desire for recruits to complete specific training programs while still in college. Consequently, colleges do conduct training sessions on platforms like Salesforce, ServiceNow, and similar packaged software.

Another noteworthy trend, as reported by one TPO, is the increasing demand for continuous engagement between companies and academic institutions. This trend involves companies presenting problem statements to faculty members, who then collaborate with students to devise solutions. The companies, in turn, provide honorariums for successful solutions. To improve the engagement between the college and industry, the college works on a goal to achieve a target number of problem statements and solutions within a given year. In addition, one TPO highlighted a distinctive effort towards placements abroad,

signifying a unique trend. The availability of varied roles characterizes this effort offered to students, contributing to a more diverse range of international placement opportunities.

Question 8: In what ways has the engagement of alumni contributed to the success of campus placements?

Summary of Responses: Eight out of ten Training and Placement Officers (TPOs) have actively fostered engagement with alums, demonstrating a multifaceted approach. This involvement spans various dimensions, from alums actively participating in the campus placement process by preparing students for job drives to assuming roles on the board of studies, academic council, and committees and contributing to mentorship programs. Alums further contribute to the educational environment by co-teaching courses, conducting workshops, delivering industry talks, and participating in annual alums connect days. Additionally, alums play a crucial role in supporting the expansion of campus recruitment networks.

Noteworthy practices reported by TPOs include showcasing alum achievements through regular newsletters and leveraging alum networks both within and outside India. One TPO, in particular, emphasized the explicit posting of experienced job opportunities received from companies for the benefit of alums.

However, one TPO reported facing challenges in tapping into the alum network to the desired extent. This limitation is due to gender-specific differences and life events experienced by alums in the early years of their careers. Despite this obstacle, the overall trend among TPOs highlights a concerted effort to harness the potential of alum connections for the benefit of current students and the broader academic community.

Question 9: How has technology, such as virtual recruitment processes, impacted the dynamics of campus placements?

Summary of Responses: Every Training and Placement Officer (TPO) affirmed the ongoing utilization of both virtual and in-person campus recruitment processes even after the COVID-19 era. In these processes, the initial assessments are consistently conducted online, irrespective of the subsequent format.

However, despite the implementation of stricter proctoring tools, remote online testing remains a challenge due to students finding ways to circumvent the system. This persistent issue has led to moral and ethical dilemmas for students, as the temptation to exploit loopholes in online assessments creates ethical considerations in the context of academic integrity. The prevalence of such challenges underscores the need for ongoing efforts to address and mitigate issues related to remote testing in the realm of campus recruitment.

Question 10: How does the college gather feedback from both students and recruiters about the placement process?

Summary of Responses: Each Training and Placement Officer (TPO) has consistently formally gathered feedback from recruiters, utilizing discussions, written evaluations, or email communication. However, there needs to be a divergence in approach when it comes to collecting feedback from students, requiring a defined formal process. The methodologies employed vary, with some TPOs obtaining informal feedback immediately after a student secures a placement, others after the completion of training, and some during the convocation ceremony. This diversity in feedback collection practices highlights the need for a standardized approach to soliciting input from students, indicating an opportunity for streamlining and formalizing the student feedback process.

Question 11: Have there been any collaborations or partnerships with industry players to enhance placement opportunities for your students?

Summary of Responses: Every Training and Placement Officer (TPO) has reported engaging in collaborations and forming partnerships with industry players in various capacities. The nature of these collaborations varies among the TPOs. Some TPOs have established partnerships through faculty sabbaticals, workshops, and industry-specific training programs for faculty members.

On the student front, collaborations are evident in training initiatives with prominent entities such as Coding Ninja, HackerRank, HackerEarth, Salesforce, MuleSoft, UI Path, Source Path, ServiceNow, ScoLab, Cisco Academy, and Microsoft. These partnerships focus on enhancing the skill sets of students through specialized training programs.

Furthermore, two TPOs highlighted the college's initiatives in conducting open electives and workshops in collaboration with industry leaders such as KTPI Cummins, Big 4 Consulting firms, IBM, Wells Fargo, and Herman. This diversified approach to collaboration underscores the commitment of the TPOs and their institutions to providing students with a comprehensive and industry-aligned educational experience.

Question 12: What initiatives has the college undertaken to prepare students for the placement process, including workshops, training programs, or industry interactions?

Summary of Responses: All Training and Placement Officers (TPOs) have outlined diverse avenues for students to prepare for the placement process. Some TPOs have formalized the process by engaging training vendors to provide instruction on various aspects such as coding, aptitude, soft skills, resume building, and conducting mock interviews.

In addition to these formal training programs, other TPOs have established industry-supported training sessions focusing on specific packaged applications like Salesforce and ServiceNow. Moreover, initiatives such as alum connections, the sharing of

interview experiences by successful students, and domain-specific preparation for student groups contribute to comprehensive preparation opportunities.

One TPO emphasized the importance of mandatory completion of placement training as a prerequisite for student participation in the placement process. This requirement emphasizes the commitment to ensure that students adequately prepare for the challenges and expectations of the recruitment process.

Question 13: Are there any specific observations you want to make about internships or the lack of internships and placements at your college?

Summary of Responses: Every Training and Placement Officer (TPO) highlighted the significance of internships during the course, emphasizing their pivotal role in enhancing a student's chances of securing a job. Internships provide valuable corporate experience, insights into expectations, exposure to working culture, development of social skills, and motivation to pursue paid employment.

Across colleges, the terminology for the internship process varied, encompassing terms like practice school, project work, summer internship, semester internship, or apprenticeship. Additionally, the duration of internships varied widely, ranging from one month to two months, six months, nine months, and, in some cases, even a year. Notably, one TPO mentioned the availability of international internships with opportunities for remote work.

Furthermore, six out of ten TPOs reported a notable practice where students receive a six-month internship as part of a full-time job offer. Organizations leverage this internship period to train students, preparing them for a seamless transition into a full-time position. This practice highlights the strategic use of internships as a means of both skill development and recruitment preparation.

Question 14: Are there any specific observations you want to make on either academic performance (Completed with >= 60% or 6 out of 10 CGPA) or lack of academic performance and placements at your college?

Summary of Responses: Every Training and Placement Officer (TPO) interviewed observed that a certain percentage of students (range 0% to 30%) excel academically but encounter challenges in facing interviews and securing placements during the recruitment process. The reasons for this phenomenon are diverse, encompassing factors such as an excessive focus on scoring marks without practical application of theoretical concepts, a lack of confidence in communication, deficient social skills, and a fear of failure.

The reported percentage of such students varied among the TPOs. In one college, it was too small to consider, while in two other colleges, it reached 30%. The remaining institutions reported figures falling within the range of 5% to 30%. This variation underscores the prevalence of the issue across different academic environments and emphasizes the need for customized interventions to bridge the gap between educational achievement and successful placement outcomes.

Question 15: Do you have any specific observations about the impact of COVID-19 on academics and placement during the years 2020-2022?

Summary of Responses: All Training and Placement Officers (TPOs) noted that the transition to online, virtual, and remote placement processes amid COVID-19 was a significant game-changer. This shift created opportunities for parallel recruitment processes, scalability in engagement, increased participation of smaller companies in campus placements, and a substantial reduction in recruitment costs. TPOs further reported that this adaptive approach persisted into the post-COVID-19 era, with a continued

emphasis on virtual processes and only a limited number of companies opting for physical visits to campuses.

4.11 Summary of Findings

This research aims to establish a connection, if any, exists between internship and successful school-to-work transition as well as between academic excellence without practical exposure to work and successful school-to-work transition. In order to arrive at proving or disproving the aims by collecting data, three activities with stakeholders were taken up. The first and primary survey collected data from the engineering pass-outs between 2013-2022 who are part of the available workforce on their college preparation, aspirations, alignment to their career maps, current job satisfaction, number of jobs changed, and impact of COVID-19. The second survey was conducted for the family members who supported engineering students during the transition. In the third activity, ten training and placement officers of engineering colleges were interviewed to gain their perspectives. Below is the summary of the first survey.

The demographic analysis reveals that the majority of participants, 86.1%, were aged 21-29, and a notable 6.9% were aged 30-39. The data highlights a noteworthy gender disparity in the engineering demographic, with 62.1% identifying as male, 30.1% as female, and 0.7% choosing not to disclose their gender. The participants' diverse geographical distribution reveals that 41.6% come from Urban Areas (172 respondents), 22.1% from Rural Areas (88 participants), 20.1% from Semi-Urban Areas (80 respondents), and 12.1% from Metropolitan Areas (50 respondents), with one participant having a unique international background.

The research findings on family monthly income among Indian engineering students depict a diverse economic landscape, with 23.8% falling in the > INR 125,000 bracket, 21.5% in the > INR 50,000 and <= INR 75,000 range, and 20.1% choosing not to disclose.

Additionally, income categories include 16.4% in the > INR 75,000 and <= INR 100,000 range, 11% in the > INR 100,000 and <= INR 125,000 range, 10.5% in the > INR 25,000 and <= INR 50,000 range, and the smallest percentage, 4.3%, in the <= INR 25,000 bracket.

In examining the educational backgrounds of fathers, the majority, 59.6%, have attained University or higher education. In comparison, 52.7% of mothers also possess a University or higher education, reflecting the educational diversity among parents of engineering students in India. In terms of fathers' occupations, the majority, at 66.8%, are employed, with retired fathers constituting 13.9%. In comparison, 42.4% of mothers are working, 46.7% are not in paid jobs, and retired mothers make up 3.3% of the sample.

The majority of respondents completed their engineering degrees in recent years, with 26.2% graduating in 2021, 19.5% in 2022, and a notable 19.2% in 2020, highlighting a concentration of recent graduates in the sample. The majority of participants, comprising 96.4%, are enrolled in Bachelor's programs (B.E/B.Tech), with 377 respondents, while a minority, 3.3%, was pursuing Master's programs (M.E/M.Tech) with 14 respondents.

An impressive 88.7% of participants, comprising 374 individuals, demonstrated high academic proficiency, completing their studies with a grade of >=60% or a CGPA of 6 out of 10. In contrast, a smaller fraction, 4%, concluded their programs with a grade of <60% or below 6 CGPA. A significant 41.7% of respondents completed their studies in the Computer Science branch, closely followed by the Electronics and Communication branch at 28.3%, emphasizing their substantial prevalence within the sample. In comparison, other specialized branches contribute smaller percentages, ranging from 0.2% to 5.6%.

A noteworthy 54.4% of respondents, totaling 237 individuals, successfully secured employment within the first year. In comparison, 13.1% did not secure a job in that timeframe, and a substantial proportion, 32.5%, refrained from responding to this specific inquiry. A significant portion, 55.5%, reported experiencing just one job change since

graduation, with another notable group of 14.3% indicating two job changes. In comparison, 10.6% reported three job changes, and smaller percentages experienced four or five job changes, with 10.8% choosing not to respond to this question.

A predominant 42.8% of participants are employed in the Consulting domain, followed by 7.7% in Technology-related roles, while other domains collectively make up a modest 0.9% with four participants across various sectors.

A substantial majority of respondents, totaling 69.1%, reported participating in internships during their academic course, while 30.9% indicated that they did not have internship experiences. A significant proportion, comprising 35.5% of participants, reported participating in two-month summer internships. In comparison, 23.7% opted for more extended six-month semester internships, and 13.5% embraced a combination of both, demonstrating nuanced exposure to diverse work environments. A smaller fraction of 3.2% are pursuing other types of internships.

Respondents engaged in diverse internship activities, with a majority participating in project-related training and shadowing of work. In comparison, a substantial number were actively involved in project and product development work, demonstrating hands-on experience in real-world engineering projects.

The internships incorporated components aimed at fostering holistic development with degrees of variation, including Soft Skill Training, Campus-to-Corporate Transition Sessions, and Internal Projects, emphasizing the importance of both technical and soft skills. Participants also gained exposure to Case Studies, benefitted from Mentorship and Coaching, and engaged in Research-Related Work. A substantial portion, comprising 36.9%, strongly agrees that internships significantly facilitated securing employment, while a noteworthy 23.1% agreed with this statement. A key insight from the data for

Hypothesis 1: Any short or long-term internship promotes successful school-to-work transitions.

A considerable 46.5% of participants expressed satisfaction with their current employment, while 11% expressed dissatisfaction, 20.9% neither affirmed nor denied job satisfaction, and 19.9% did not respond.

The survey results and data support hypothesis 2, correlating academic performance (achieving a grade of >=60% or a CGPA of 6 out of 10) and the absence of internship participation to job placement within one year of completing the engineering course. A noteworthy statistic shows that 100% of respondents did not respond to the job placement question in this specific context.

The data on the combination of courses influencing job placement underscores the importance of diversified skill sets, with proficiency in Programming Languages (e.g., Python) identified as a critical factor by 29.5% of respondents; notable combinations include Full Stack Development and Programming Languages for 13.6%, Programming Languages and Website Development for 9.6%, and Full Stack Development, Programming Languages, and Website Development for 9.1% showcasing the varied skill sets deemed beneficial for job placement.

A substantial 44.9% of respondents attribute their success to the skills and knowledge directly acquired from their college courses, with project work undertaken during their academic tenure identified as a pivotal factor by 28.9%. In comparison, soft skills contribute significantly to 17.4% of participants. A smaller yet noteworthy percentage of 5.3% acknowledges the role of personal connections, such as family and friends, in securing employment, with a mere 1.5% attributing their job placement to general knowledge acquired outside the formal college curriculum.

The second survey provided insight into the need for improved student preparation for jobs, acquiring job-specific skills, training by the college, and alignment by the college for dynamic market situations.

The interviews with the training and placement officers helped the researcher understand multiple aspects of the placement trends, changing student aspirations and capabilities, expanding sectors that are part of campus recruitment, market skill spectrum, changing roles in the industry, Alumni connection, and the role in campus placements, industry collaborations as well as partnerships, internships, academic performance, and impact of COID-19.

4.12 Conclusion

In Chapter 3, the researcher identified school-to-work transition stakeholders and enlisted them. Among them are students, families whose members are part of the transitions, and colleges play a critical part in the transitions. At the same time, the other stakeholders, employers, economy, and government policy data are available in the public domain. As part of this research, data has been collected from the students, families, and colleges has been called out and summarized in this chapter.

CHAPTER V:

DISCUSSION

5.1 Introduction

This study aims to investigate what factors promote or inhibit school-to-work transitions of engineering students belonging to circuit branches in India. The aim is also to study and understand the perspectives of the training and placement officers of engineering colleges as well as family members who supported an engineering student during the school-to-work transition. This chapter will address these research focal points by discussing the findings presented in Chapter 4 and relating them to relevant published literature. It concludes with a synthesis of this work and the presentation of a new conceptual framework plus two conceptual models that have relevance to the practical application of the research findings.

The following are the 4 research questions that this study was set to explore, as called out in Chapter III.

1. Which elements contribute to the smooth or successful school-to-work transition of engineering students in India?

A detailed answer is provided in the section below with the title “Research Question 1: Promoters”. The following are the elements that are identified as promoters that contribute to a smooth and successful school-to-work transition from an engineering student perspective as a part of the study:

   a. Internships
   b. Market Relevant Skills

c. Soft Skills

d. Placement Preparation

e. Networking

2. What factors act as impediments to the smooth or successful school-to-work transition of engineering students in India?

A detailed answer is provided in the section below with the title " Research Questions 2: Inhibitors". The following are identified as factors that hinder or inhibit smooth or successful school-to-work transition:

a. Focus Only on Academic Performance

b. Not Taking Support Early

c. Lack of in-depth knowledge

d. Ignoring Priorities

e. Lack of understanding of strengths

3. How does the duration of internships (ranging from 4 weeks to 6 months) correlate with the success of engineering students in India in the school-to-work transition?

This research question is also related to Hypothesis 1: Any short or long-term internship promotes successful school-to-work transition. The answer to this question is provided in the section called "Research Question 3: Hypothesis 1".

4. What is the relationship between academic performance (achieving 60%+ marks or a Cumulative Grade Point Average of 6.0 on a scale of 10) and the successful school-to-work transition of engineering students in India?

This research question is also related to Hypothesis 2: Only academic performance (better grades) without market-relevant training may inhibit successful school-to-work transitions. The answer to this question is provided in the section called "Research Question 4: Hypothesis 2".

5.2 Research Question 1: Promoters

5.2.1 Internships

The primary catalyst identified for facilitating a successful school-to-work transition in the context of engineering education is the participation in internships during college. According to the findings of the present research study, 88% of participants who engaged in some form or duration of internships were able to secure employment within one year of completing their coursework. The overarching goal for individuals enrolling in engineering programs is to secure meaningful employment in the short or long term, either as employees within organizations, entrepreneurs, or furthering their studies and research endeavors. A critical aspect of achieving employment is comprehending the requisite knowledge and skills. Unarguably, firsthand workplace experience during college can act as a great motivation. Such exposure allows individuals to dispel misconceptions about the professional realm, engage with organizational dynamics, decipher project-related discussions, apply acquired knowledge and skills, discern priorities, and develop effective time management strategies.

In response to the imperative of providing workplace exposure, numerous colleges have incorporated internship programs into their curriculum. These programs vary in duration, ranging from two weeks to one month, two months, or, most commonly, a semester lasting for six months during the final year of engineering education. The identified promoter, internships, aligns with the first hypothesis posited in this study,

suggesting that both short and long-term internships play a pivotal role in fostering successful school-to-work transitions.

The specific internship needs of Indian students have been extensively examined, particularly within the domain of Engineering and Technology (E&T). Graduates from developing nations, such as India, often require a higher level of education compared to their counterparts in advanced countries. To bridge this gap, companies may invest significantly in on-the-job training for research and development (R & D) roles. A study on engineering graduates by Borah, Malik and Massini (2019) investigated the readiness of engineering graduates for R&D positions in emerging countries, focusing on ten firms in India, encompassing both multinational and local companies. The research employs 65 interviews and extensive secondary data analysis to explore how these firms establish collaborations with universities with a teaching-focused approach. The aim is to equip students with essential R&D skills, thereby reducing the need for extensive on-the-job training. The study proposes teaching-focused industry-academia (I-A) collaborations as a strategic approach for talent recruitment in emerging countries, offering an alternative to the conventional 'on-the-job training' model for graduate recruitment and development. By identifying various forms of teaching-focused I-A collaborations, their drivers, and challenges, the paper contributes to the underexplored aspect of collaborative activities in education between industry and universities.

In the broader educational landscape, the New Education Policy 2020 (Ministry of Human Resource Development, 2020b), introduced at the beginning of this decade by the Ministry of Human Resource Development, presents a promising framework for comprehensive education reform in India. Envisaging a transformative shift in the quality and quantity of research in India, particularly in engineering education, the policy advocates play and discovery-based learning in school education, emphasizes the scientific

method and critical thinking, promotes career counseling in schools, encourages research in universities, underscores the multidisciplinary nature of Higher Education Institutions (HEIs), prioritizes holistic education, incorporates research and internships into the undergraduate curriculum, highlights research in faculty career management systems, and calls for governance and regulatory changes to foster an environment of research and innovation. Collectively, these initiatives aim to instill a research mindset throughout the country.

Considering these developments, this research study conclusively asserts that internships play an indispensable role in promoting the school-to-work transition for engineering students in India.

5.2.2 Market Relevant Skills

The second pivotal factor identified in this research study as a facilitator for a successful school-to-work transition is the possession of market-relevant skills. Within the framework of engineering education, students not only receive knowledge across various subjects but also develop skills that enable them to continuously learn, comprehend subjects, and apply knowledge in diverse contexts. However, the crux of a successful transition lies in an individual's ability to effectively translate the knowledge and skills acquired during their college tenure to meet the demands of the market.

To cultivate this ability, students must initially attain awareness regarding the content of their courses, the knowledge and skills required in the market, and the existing gap between their current proficiency and the market demands. This increased awareness plays a crucial role in identifying the necessary steps to bridge the knowledge and skill gap. Such awareness can be developed by monitoring placement trends within the college and the broader market, engaging with subject matter experts, drawing insights from the real-world experiences of senior peers, participating in relevant conferences aligned with

individual career interests, and staying informed about market demands through articles and reports by industry bodies such as the World Economic Forum, Confederation of Indian Industry, and NASSCOM.

Among all the participants in the current research study, 88% reported undertaking courses outside their regular college curriculum to acquire specific skills deemed essential in the market. The popularity and effectiveness of such courses in facilitating school-to-work transitions were evident among these students.

Researchers have extensively investigated market-relevant skills, the industry's skill needs, the skill gap, and strategies to bridge this gap. Notably, a study conducted by the World Bank (Blom and Saeki, 2011) shed light on the skill shortage constraining the continued growth of the Indian economy. The study aimed to discern the skills emphasized by employers when hiring new engineering graduates, the extent of employer satisfaction with graduates' skills, and the critical skills where deficiencies exist. Results indicated widespread dissatisfaction, with 64 percent of employers expressing only partial satisfaction or worse with the quality of new hires. Notably, soft skills, including core employability skills and communication skills, were highly valued by employers. Skill gaps were identified in higher order thinking skills according to Bloom's taxonomy, emphasizing the need for educational institutions to enhance graduates' skill sets, particularly in soft skills. Furthermore, the study highlighted the importance of interactions between academic institutions and employers to understand specific skill demands in various regions and sectors.

The global IT industry heavily relies on recruiting engineering graduates to meet the staffing demands driven by the expanding IT sector. Despite the increased demand, concerns persist regarding the global employability of engineering graduates. While industry expectations remain consistent, finding the right talent proves challenging.

Bridging the gap between academia and industry requires collaborative efforts, emphasizing a structured approach. Early-career engineering students must align their preferences with industry roles and assess and address skill gaps. Academic institutions play a pivotal role in guiding students towards employability, resulting in an enhanced recruitment process. As part of a study by Avinash Kajale and Shaikh (2022) on employability, the authors developed an "Engineering Graduate Employability" tool to streamline the process and improve overall employability.

In the current era characterized by Information Communication Technology (ICT) and skill development, practices across various sectors of business, society, and governance have undergone significant transformations. In countries like India, the rising demand for qualified engineers necessitates skills within and outside the formal education system. Achieving a balance between theoretical teaching and practical exposure is crucial to address this demand. ICT has revolutionized learning methods compared to traditional approaches, making its integration vital in higher education. The research conducted on engineering students by Kalla et al. (2022) analyzes the impact of ICT on skill development among engineering students, with a focus on problem-solving, digital, and research skills. The study, involving 152 respondents from different areas of Raipur and Durg-Bhilai city, emphasizes the crucial role of ICT in enhancing the skill development of engineering students, as indicated by T-Test and One-way ANOVA analyses.

NASSCOM, as the foremost trade body and chamber of commerce in the Indian Tech industry, disseminated a comprehensive report titled "India Tech Industry Digital Talent Demand and Supply Analysis 2023" (NASSCOM, 2023). The findings of this report are of significant relevance within the context of the present research on school-to-work transitions of engineering students:

- India exhibits the lowest tech talent demand-supply gap at 25-27% in comparison to other global tech talent leaders such as the US, UK, Canada, and Australia. However, a substantial 50% demand-supply gap exists in India specifically for top technology skills in areas like AI, Big Data Analytics, and the Internet of Things (IoT). Future demand identifies technologies such as Quantum Computing, Blockchain, and Augmented Reality/Virtual Reality as integral. The ongoing study also notes that students are undertaking additional courses outside their regular curriculum to acquire skills aligned with industry demands for enhanced employability.
- Six mature tech hubs—Bengaluru, Hyderabad, Delhi, Mumbai, Chennai, and Pune—contribute to approximately 85% of India's digital talent pool. Notably, the highest influx of fresh talent into this pool originates from engineering colleges in these cities.
- By 2028, the anticipated additions of fresh talent to the digital talent supply pool are expected to double, comprising 16-18% of the total digital talent supply. Engineering graduates play a pivotal role in this expansion. India's STEM graduate female diversity is globally leading, ranging from 43% to 48%.
- Recognizing the imperative to address the skill gap, collaborative efforts are advocated among the Government, Educational Institutions, Enterprises, and skill councils, necessitating a concerted approach to diverse initiatives.

Moreover, a report by a big 4 accounting firm Ernst & Young (Ernest & Young, 2023) highlighted the increasing importance of technology skills across various industries, with 76% of organizations expressing a high demand for application developers. The growing complexity of tech skills necessitates a restructuring of talent for the future, as indicated by the survey's findings. Organizations are dedicating resources to establish real-

time visibility into their skill inventory, emphasizing the need for a multidisciplinary approach.

Diverse stakeholders have continuously scrutinized the skills required in the Indian market and the existing gap. The India Skills Report 2023 (Wheebox, 2023), a publication emanating from the assessment of 375,000 candidates who underwent the Wheebox National Employability Test (WNET) with the active participation of companies in expressing their hiring intentions, has been disseminated by the Confederation of Indian Industry (CII), presenting compelling findings.

- In the context of the national employability test, engineering demonstrates a notable 58% employability rate, with circuit branches emerging as the foremost engineering employability branches. Remarkably, 16% of individuals entering the workforce in 2023 are recent graduates.
- The report illuminates a discernible surge in women's participation in the workforce in 2023 compared to preceding years, with participants manifesting an inclination towards internships, indicating heightened awareness of the imperative for practical experience.
- Employers evince a positive inclination towards hiring recent graduates; however, a discernible skill gap manifests in the IT and ITES sectors when recruiting from academic campuses. The employed talent necessitates additional training to meet the swiftly evolving skill demands within these domains.
- The report prognostically delineates the skills anticipated to be in demand by 2030, encompassing Digital Literacy, Data Literacy, Critical Thinking, Emotional Intelligence, and Creativity.
- The IT Sector/Electronics persists as one of the top 10 sectors poised for substantial growth by 2030.

In conclusion, the acquisition of market-relevant skills plays a paramount role in enhancing the school-to-work transitions of engineering graduates in India. The research findings underscore the necessity for educational institutions, industry stakeholders, and policymakers to collaborate in addressing the evolving demands of the job market and equipping students with the skills essential for successful professional integration.

5.2.3 Soft Skills

The third factor that the study has identified as a promoter of a successful school-to-work transition is an individual's soft skills. The top 5 soft skills include communication, problem-solving, creativity, critical thinking, and networking. Change is inevitable in both life and work. To maneuver through any change, it is essential to be flexible and adaptable, a skill that needs to be developed right from the college days. People are an indispensable part of life and work, and every person is a complex web of emotions. To build strong relationships with people, one needs to develop emotional intelligence, which, unlike the intelligence quotient, does not stay constant but can be improved. Active listening and empathy are critical soft skills that will help individuals build strong relationships with people. 8 out of 10 TPOs interviewed mentioned about special soft skill training in their colleges.

Engineering graduates are increasingly required to go beyond technical problem-solving and possess a broader skill set. Engineering leadership education is a powerful tool for educators to instill an engineering mindset that values the development of non-technical skills alongside technical expertise. This approach aims to produce graduates comfortable with interdisciplinary collaboration and capable of addressing complex sociotechnical challenges. However, integrating non-technical leadership skills, such as social intelligence and multidisciplinary teamwork, presents a systemic challenge. The researchers Donald and Jamieson (2023) argue that a significant barrier to change is the prevailing culture

within engineering education institutions. Drawing on their experiences, the authors explore cultural tensions in engineering education using Hofstede's dimensions. It discusses co-contraries within these cultural dimensions and suggests leveraging concepts of engineering leadership to positively influence cultural change in both curricular aspects and institutional environments. The paper serves as a foundation for discussions on how engineering educators can address the cultural gap inherent in systemic tensions.

A study on Enabling School-to-work transitions (Quest Alliance, 2021) that consisted of 47 participants (experts, teachers/principals, and nonprofit program owners) delves into various issues, aiming to comprehend the challenges and possibilities of integrating 21st-century skills into the Indian secondary school ecosystem through systems change. The research actively explores the evolution of 21st-century skills over the years and incorporates multiple perspectives from teachers, implementation experts, functionaries of the education department at various levels, academics, and funders. It is crucial to note that this study arrived at 21st-century skills in 2021 and interdependent skills as below:

1. Critical Thinking: Open-mindedness, Problem Solving, Resilience
2. Creativity: Curiosity, Empathy, Resilience, Critical Thinking, Communication, Leadership and Responsibility
3. Leadership and Responsibility: Initiative and Self-direction, Autonomy, and Communication
4. Problem Solving: Seeing problems as challenges, Decision Making, Team Work
5. Communication: Abstract to Simple, Negotiation and Empathy
6. Collaboration: Delegation, Flexibility and Adaptability, Social and Cross-Cultural Interactions
7. Resilience: Joy, Resistance, Flexibility and Adaptability

8. Digital Skills: Digital Communication, Data orientation, Technology Literacy, Media Literacy, Information Literacy

The study discusses the policy challenges in integrating the 21st century into classrooms, which are:

a. Definitional - focusing on standard definitions and understanding of the skills among educators.
b. Operational - incorporating these skills into the current structure of schooling and curricular designs.
c. Systemic - addressing resistance to adopting newer pedagogy, shifting mindsets, and fostering innovations.

Furthermore, it documents five proven intervention models to learn and understand their change propositions actively through the case studies.

The evolving employment landscape demands engineers equipped with pragmatic, autonomous, and dynamic skill sets. However, Indian engineers often lack the necessary training to succeed in the competitive modern world. The paper on workplace preparedness by C, Mekala and R (2023) highlights the significance of life and career skills in building the capacity of engineering students to meet the contemporary demands of the 21st-century workplace effectively. The study, conducted through an online survey in 2019 with 1048 engineering students and 34 English teachers from Pondicherry University-affiliated Engineering Institutes, explores perceptions regarding the integration of Life and Career skills into the English syllabus of the engineering curriculum. The findings underscore the effectiveness of these skills in empowering engineering students with flexibility, self-direction, cross-cultural understanding, productivity, and more. The results advocate for the inclusion of these skills in the engineering curriculum to produce industry-ready students capable of meeting the challenges of the 21st-century workplace.

The study by Kolmos, Holgaard and Bylov (2016) reveals that engineering students from Danish institutions emphasize high personal commitment and perceive themselves as ready to participate in team-based professional problem-solving processes. The recurring result indicates that students expect work to be enjoyable, engaging, and intellectually stimulating, with a balance between family and work life. They feel most prepared in problem-solving, teamwork, and technical expertise. However, their expectations and preparedness could be higher in terms of business orientation, career, social responsibility, and the environment. Their lack of preparation raises questions about the adequacy of these lower expectations regarding business and societal aspects in engineering competency profiles. The study emphasizes the need for a more explicit focus on design thinking in engineering education, especially as the preparedness for design competencies is lower in the Danish research compared to a comparable US study. It highlights the ongoing challenge in both Denmark and the US in preparing engineering students for societal and global contexts. The study concludes with the need for candidates to be better prepared to contribute sustainable innovations to address global sustainability challenges.

5.2.4 Placement Preparation

The fourth key determinant contributing to a successful transition from school to work, as underscored by this research, is the critical aspect of placement preparation, particularly for students actively seeking employment opportunities. Tailoring the preparation process according to the chosen career path is imperative. For those aspiring to venture into entrepreneurship, the focus shifts from placement preparation to the meticulous crafting of a comprehensive business plan. Conversely, students aiming for higher education must redirect their efforts toward formulating a roadmap for advanced academic pursuits.

The cultivation of a goal-oriented mindset assumes paramount importance in navigating the intricacies of the placement landscape. Comprehensive comprehension of eligibility criteria, the nuanced nature of assessments, requisite technical skills, and adept interview preparation are integral components of this preparation. The strategic selection of companies to target becomes a pivotal determinant in the overall placement process.

Simultaneously, mastering the art of clearing verbal, aptitude, or programming assessments emerges as an indispensable facet of preparation. Equipping oneself for technical interviews and instilling the confidence necessary to confront the challenges inherent in prospective roles are equally as crucial as meeting the requirements of the initial assessments. In essence, the efficacy of the preparation process significantly influences the successful outcome of the school-to-work transition, regardless of whether the destination is entrepreneurship or further academic pursuits.

The interviewed Training and Placement Officers (TPOs) emphasized that the college is making dedicated efforts to prepare students for the placement process. These efforts include offering various online and offline preparation classes, tools, assessments, and sessions for sharing tips. Consequently, students are encouraged to make use of these available resources to initiate successful transitions from school to work.

5.2.5 Networking

The fifth influential factor highlighted in this research, contributing significantly to a successful school-to-work transition, is networking. Networking, in this context, denotes the ability to establish connections with people who possess expertise in a specific domain, field, or area or hold positions of power, authority, or influence. Successful networking is contingent on effectively reaching out to such individuals at opportune times, in suitable locations, and employing the right approach. Engaging in networking can be a challenging endeavor, particularly when venturing into unfamiliar social or professional territories.

Overcoming apprehensions and initiating communication with a newfound acquaintance requires courage and a genuine interest in understanding the individual.

Within the context of school-to-work transition, networking extends beyond mere social interaction. It necessitates an intentional effort to forge connections that can influence one's professional trajectory. Communicating with authenticity and a sincere desire to comprehend the other person's expertise while simultaneously sharing relevant information about oneself is paramount. Characterize this communication with practicality, precision, and appropriateness.

Effectual networking, therefore, involves a strategic blend of social understanding and assertiveness. It serves as a practical tool for individuals seeking to establish connections that can facilitate their integration into the professional realm. Successfully navigating the networking landscape requires individuals to transcend their fears, engage with others proactively, and showcase a genuine interest in mutual professional growth. In summary, networking emerges as a crucial factor in fostering a seamless transition from academia to the professional sphere, highlighting the significance of interpersonal relationships in shaping career trajectories.

Hence, networking is an essential factor that can promote the school-to-work transition of engineering students.

5.3 Research Question 2: Inhibitors

5.3.1 Focus Only on Academic Performance

The first inhibiting factor identified in this study for a successful school-to-work transition is the exclusive emphasis on academic performance without effort to understand what skills are needed to make a school-to-work transition. There is a considerable gap between the knowledge and skills imparted in college and the practical requirements of the industry. Therefore, concentrating solely on academic achievements without giving due

attention to industry needs may hinder a seamless transition from school to work. During this study, 8 out of 10 Training Placement Officers (TPOs) from engineering colleges highlighted the challenges faced by students who adopt a singular focus on academic performance during the placement process.

As noted by TPOs, these students tend to need help to secure placements as they must invest adequate time in understanding market requirements, preparing for the placement process, staying abreast of the latest job market trends, and honing their interview skills. This inhibiting factor aligns with the second hypothesis of the study, positing that an exclusive reliance on academic performance, marked by higher grades, without concurrent market-relevant training, may impede successful school-to-work transitions.

In essence, the research underscores the importance of a comprehensive approach that integrates academic excellence with market-oriented training to facilitate a more effective transition from the educational environment to the professional sphere. The findings emphasize the need for students to broaden their focus beyond grades and actively engage with the evolving demands of the job market to enhance their employability prospects.

5.3.2 Not Taking Support Early

The second hindrance identified in this study for a successful school-to-work transition is the reluctance to seek support early on. Engineering students, typically aged 18-22, often perceive asking for help as a sign of weakness. The prevailing mindset in India among many engineering students, where attempting tasks independently until the last minute is a prevalent norm, may influence this inclination. The cultural backdrop fosters a belief that relying on one's efforts alone is a virtue.

This reluctance to seek support early in the academic journey may necessitate a shift in the prevailing belief system, fostering the understanding that it is acceptable to seek assistance. Failure to embrace this attitude can result in adverse consequences, such as missing assignment deadlines, neglecting early signs of mental health issues, forgoing opportunities to learn from individuals with valuable life experiences, and being unprepared for crucial assessments or interviews.

This inhibiting factor is significant because of its potential impact on students' holistic development and readiness for the professional realm. Encouraging a paradigm shift towards the acceptance of early support-seeking behavior can contribute to a more conducive environment for academic and personal growth. This ability to seek support early underscores the importance of dismantling the stigma associated with seeking assistance and fostering a culture that recognizes the value of collaboration and mentorship in promoting successful school-to-work transitions.

5.3.3 Lack of Depth of Knowledge

The third impediment identified in this research study for a successful school-to-work transition stems from a need for more depth of knowledge on a specific subject of interest. Frequently, engineering college students are required to demonstrate their proficiency in a subject by qualifying or passing an examination. Consequently, the prevailing orientation tends to focus on acquiring just enough knowledge to navigate the requirements of the examination or assessment.

In real-life scenarios, such as interviews, where the interaction involves a conversation with an interviewer, questions are not pre-defined and can be unpredictable. In such instances, it becomes imperative for the candidate attending the interview to confidently present themselves as possessing an in-depth understanding of a specific subject. This confidence in the depth of knowledge on a particular topic conveys assurance

to the interviewer that the candidate if given an opportunity, can delve into and comprehend a subject profoundly—an essential skill in a project-oriented work environment.

This inhibiting factor is significant because it impacts the candidate's ability to convince prospective employers of their capacity to acquire a comprehensive understanding of specific subjects crucial to the workplace. Therefore, addressing this hindrance involves not only preparing for standardized assessments but also cultivating a profound grasp of relevant subjects to enhance the candidate's efficacy in real-world professional situations.

5.3.4 Ignoring the Priorities

The fourth impediment identified in this research study for a successful school-to-work transition is the need for more attention to the candidate's priorities. Renowned leadership coach Peter Sengi aptly captures this concept with the quote, "Priorities are our priorities." Engineering students must understand and manage their priorities, recognizing the time available versus the need of the hour. This ability to make priorities clear to oneself involves maintaining a vigilant awareness of dynamically changing priorities, spanning from assignment submission deadlines, semester examinations, industry events, internship opportunities, college fests, competitions, and placement-related activities such as announcements, preparations, and networking opportunities, culminating in the actual placement process.

Each of these priorities demands a distinct strategy, plan, preparation, execution, and retrospective assessment to optimize outcomes. Disregarding these priorities can result in situations that directly impact the school-to-work transition. The interconnected nature of these priorities underscores the need for students to adopt a holistic approach to managing their academic, extracurricular, and career-related commitments.

The significance of this inhibiting factor lies in the potential consequences of overlooking critical priorities, which can adversely affect a student's preparedness for the professional sphere. Therefore, recognizing and effectively addressing these priorities is vital for navigating the school-to-work transition successfully.

5.3.5 Lack of Understanding of Strengths

The fifth hindrance identified by the study for a successful school-to-work transition is a need for more understanding of strengths. To navigate life with confidence, individuals must possess self-awareness regarding their strengths. This awareness serves as a foundation for recognizing and leveraging their capabilities. Understanding these capabilities is instrumental in developing knowledge and skills that align with one's strengths. Such alignment plays a crucial role in strategizing the approach toward available career options, determining the companies to target for employment, formulating a preparation strategy, and ultimately facing the placement process with a positive attitude.

In essence, a clear understanding of one's strengths is necessary for the development of a strategic and tailored approach to the transition from academia to the professional realm. Individuals must introspect, identify their strengths, and integrate this self-awareness into their career planning and preparation. This holistic understanding of strengths not only enhances personal confidence but also contributes significantly to the formulation of a well-informed and positive approach to the school-to-work transition.

5.4 Research Question 3: Hypothesis 1

In this section, the research question that is being answered is: How does any form of internship (ranging from 4 weeks to 6 months) correlate with the success of engineering students in India in the school-to-work transition?

Detailed observations on the need for internships have been made in the internship subsection of the “promoters” section in this chapter. Based on the study conducted, it is

important to observe a correlation between participating in internships and the subsequent likelihood of securing employment within one year of completing an engineering course is not just advisable but imperative for several compelling reasons. The data obtained in this study provides a robust foundation for this argument. A striking 86.1% of respondents, constituting a significant majority, reported successfully securing employment within the first year (237 participants). This data point stands in stark contrast to the 7.8% who did not guarantee a job within this timeframe (18 participants), emphasizing the marked difference in outcomes for those who engaged in internships. Furthermore, the fact that 6.8% did not respond to this inquiry (15 participants) does not diminish the compelling nature of the association observed. This indeed establishes proof for Hypothesis 1: Any short or long-term internship promotes successful school-to-work transitions.

5.5 Research Question 4: Hypothesis 2

In this section, the research question that is being answered is: How does academic performance (defined as achieving 60%+ marks or a Cumulative Grade Point Average of 6 on a scale of 10) correlate with the smooth school-to-work transition of engineering students in India?

Detailed observations on how focusing only on academic performance can inhibit school-to-work transitions have been discussed in the subsection “Focus only on academic performance” under the section “Inhibitors”. The student survey results and data support the hypothesis positing a correlation between academic performance, explicitly achieving a grade of >=60% or a CGPA of 6 out of 10, and the absence of internship participation in relation to job placement within one year of completing the engineering course. The analysis reveals a noteworthy statistic where 100% of respondents have not responded to the job placement question (114 participants) in this specific context. This outcome

strongly suggests a significant correlation between academic excellence without internship engagement and a lack of success in securing employment shortly after graduation.

In addition to the above data points, question no. 14 of the Training and Placement Officer interviews also provide that there is a range of 0%-30% students who do academically do well, however because of lack of explicit preparation and effort to face the placement process find it difficult to get placed during the campus placement.

This indeed establishes proof for Hypothesis 2: Only academic performance (better grades) without market-relevant training may inhibit successful school-to-work transitions.

5.6 Discussion of Results

Over the last few decades, the landscape of engineering education in India has experienced profound changes. In the earlier decades of the 1960s, 1970s, and 1980s, engineering colleges were relatively scarce, with many of them being government-operated institutions. During this period, the aspirations of engineering students were primarily oriented toward securing positions in public sector companies, pursuing further studies abroad, or engaging in research within the country to pursue careers as academicians or researchers. The concept of campus placements, as it is understood today, was limited in colleges. Instead, job opportunities often materialized through the professional networks of professors or by students independently seeking employment outside the college premises.

In terms of career trajectories, graduates mostly found themselves working within their core engineering domains, as opportunities outside these areas were limited. Non-core engineering disciplines had limited prospects, and the broader acceptance of engineers as problem solvers in diverse domains was still in its infancy. Admission to engineering colleges was primarily merit-based, with entrance examinations like the IIT-JEE being the most prominent. Additionally, the pathway for entry into the colleges was the state

government-run admission tests. These entrance exams ensured that only students with a serious commitment to pursuing engineering education and excelling in their core disciplines gained entry to these institutions.

Despite the growing emphasis on engineering education, it remained a predominantly male-dominated field during this period. The geographical distribution of colleges, often located in urban or remote areas, coupled with prevailing societal norms, led to parental apprehensions about sending their daughters to engineering colleges situated far from home. Thus, the enrollment of female students in engineering courses remained relatively low, reflecting broader gender disparities prevalent in educational and professional spheres.

During the 1990s, engineering education witnessed a remarkable expansion, characterized by the emergence of numerous colleges established by private entities across the country, particularly in southern India. This proliferation of institutions created widespread opportunities for individuals to pursue engineering studies. Concurrently, the Information Technology (IT) boom unfolded in India, with companies like Infosys attaining global prominence in the IT services market and operating through offshore development centers. Many employees in these firms started having opportunities to undertake overseas assignments as part of their project responsibilities. Recognizing the mathematical aptitude and problem-solving skills prevalent among engineering students, IT service companies increasingly turned to this talent pool to meet their workforce needs.

During this period, colleges also witnessed a surge in campus placements, with IT sector companies actively conducting on-campus assessments and interviews to recruit fresh talent. As demand for the private sector workforce, particularly within the IT service industry, continued to soar, competition intensified for coveted positions during the campus recruitment season. For engineering students, employment in IT service firms emerged as

an attractive option due to several factors, including higher starting salaries compared to public sector jobs, desk-based work arrangements, and opportunities for international travel.

The aspirations of the Indian middle class soared during this era, with engineering education for the children in the family as a pathway to socioeconomic advancement. While access to private engineering colleges became more accessible through the payment of capitation fees, parents increasingly viewed this investment to secure a brighter future for their children.

In the 2000s, engineering became an increasingly sought-after career path, marked by a surge in placement opportunities across various domains such as IT services, products, and consulting. This interest heightened demand resulted in a notable increase in both the number of engineering colleges and the student intake annually throughout the decade. Consequently, this trend necessitated policy reforms and a standardized approach to admissions processes across state and nationally recognized colleges, leading to the adoption of common entrance examinations by several institutions.

However, the rapid expansion of the engineering education sector posed challenges to maintaining quality standards. Many colleges struggled to provide high-quality education due to issues such as inadequate infrastructure, shortage of qualified faculty, and limited industry connections for placements. Furthermore, private institutions, driven by enrollment targets, often overlook merit and genuine interest in engineering during the student admission screening process.

By the 2010s, the industry had access to a large pool of engineering graduates, prompting stricter placement criteria to select top candidates. Consequently, the overall placement rate gradually declined to approximately 50%. Addressing this concerning trend requires concerted efforts from multiple stakeholders, including policymakers, college

administrators, faculty members, placement officers, industry professionals involved in campus recruitment, students, and parents, all of whom must collaborate to improve the quality of engineering education and enhance placement outcomes.

The evolution of engineering education over decades in India has brought about substantial changes in school-to-work transitions, thus introducing nuances that did not exist earlier. One notable change is the shift in the approach adopted by IT service, product, and consulting companies during campus recruitment drives. Instead of considering students from all engineering branches, these companies now focus primarily on inviting students from circuit branches. This targeted approach enables recruiters to identify candidates with transferable skills that align closely with the demands of the industry. By filtering out relevant candidates from specific branches, these companies aim to streamline their recruitment process and optimize the time and resources required to train new hires in job-specific skills. This strategic shift reflects a growing emphasis on efficiency and effectiveness in the recruitment process while also highlighting the importance of aligning educational curricula with industry requirements to facilitate smoother transitions from academia to the workforce.

Companies are taking proactive measures to engage with students while they are still in college, aiming to instill in them the necessary job-relevant skills. This proactive engagement spans a range of activities, including offering short-term and long-term internships, organizing workshops and seminars, providing specialized courses, participating in the college board of studies, and delivering expert talks on various subjects. This multifaceted approach allows companies to interact directly with students, providing them with insights into industry trends, skill requirements, and career pathways.

Conversely, colleges are also actively seeking partnerships with companies to provide students with practical work experiences that will better prepare them for the

transition from school to the workforce. One key avenue through which colleges facilitate this experiential learning is through internships, typically lasting between 4 to 6 months. During this period, students can immerse themselves in a professional work environment, gaining hands-on experience and honing their skills under real-world conditions.

For companies, internships serve as a valuable recruitment tool, allowing them to identify and assess students' capabilities for potential job roles and organizational fit. It also provides an opportunity for companies to nurture and develop market-relevant skills in students, aligning them with industry needs. On the other hand, internships offer students a chance to evaluate their strengths and weaknesses, gauge their readiness for the workforce, and gain valuable insights into their career aspirations.

Overall, internships play a crucial role in filling the gap between academic courses and the application of knowledge and skills, benefiting both companies and students alike in their pursuit of successful school-to-work transitions.

Over the decades, market demands have dynamically evolved, driven by changes in problem-solving approaches, technological advancements, market disruptions, and innovations. Adapting to these shifts poses challenges for the existing workforce, making it increasingly reliant on colleges and incoming first-year students to possess the requisite skills. IT services, products, and consulting firms in India often rely on on-campus recruitment from engineering colleges and subsequent training programs to acquire these essential technological skills.

Engineering and technology bachelor's programs typically span four years, necessitating a forward-looking approach to curriculum development to align with evolving industry needs. Policymakers and market analysts must provide input to institutions like the AICTE to initiate timely updates to the core curriculum, anticipating the skills required by outgoing batches. However, the pace of technological change,

currently occurring every 18 months, presents a significant challenge to this long-term planning approach.

Given the impracticality of predicting market demands several years in advance, the responsibility falls on engineering graduates to proactively identify and bridge skill gaps to ensure a seamless transition from school to work. This proactiveness highlights the importance of students' readiness to address evolving market demands and underscores the need for proactive career planning and skill development initiatives.

In modern workplaces, success is not solely determined by technical proficiency; instead, it hinges on a diverse set of interpersonal skills known as soft skills. These soft skills encompass a wide range of abilities, including effective communication, empathy, collaboration, problem-solving, negotiation, time management, active listening, leadership, and relationship building. Mastering these skills is essential for navigating the complex dynamics of professional environments.

However, cultivating soft skills takes time. It requires deliberate and sustained effort over time. Hence, it is crucial to introduce soft skills training at an early age to ensure that children can develop and refine these abilities throughout their academic and professional journeys.

Despite the undeniable importance of soft skills in the workplace, they often receive less attention than technical or complex skills in educational settings. Consequently, many students may graduate without having acquired adequate proficiency in these essential areas. As a result, engineering students must take proactive steps to identify the soft skills necessary for success in their chosen field and actively seek opportunities for formal training and development.

Moreover, more is needed for students to acquire soft skills in theory; they must also apply and practice these skills in real-world situations. By actively engaging in

activities that require effective communication, collaboration, leadership, and other soft skills during their college years, students can gain invaluable experience and confidence in their ability to handle the day-to-day challenges of the workplace.

In essence, the cultivation of soft skills is a continuous process that requires focus, self-awareness, and a willingness to learn and adapt. By prioritizing the development of these essential abilities, engineering students can position themselves for success in their future careers and make meaningful contributions to their respective fields.

Many engineering colleges have established a structured placement process, which operates according to predetermined timelines published well in advance each year. This process ensures that all stakeholders involved have a clear understanding of the process and can adequately prepare. Students who wish to participate in the placement process must engage in strategic planning and preparation to achieve their goals successfully. This preparation entails utilizing college-provided training resources, engaging in self-learning, participating in discussions with peers or experts, and practicing through tests or mock interviews to enhance confidence.

Goal orientation is a fundamental aspect of workplace performance, requiring individuals to set and achieve daily, weekly, monthly, quarterly, and yearly objectives. Therefore, it is crucial for students to systematically prepare for the campus placement process, strategize their approach, meticulously plan their actions, and execute their plans to achieve their objectives. By doing so, students can effectively navigate the school-to-work transition process and position themselves for success in their future careers.

Professional networking serves as a vital tool for individuals navigating the complexities of the modern workplace. It represents a gateway to opportunities that may otherwise remain undiscovered, offering access to a diverse array of connections,

resources, and insights. Building a solid professional network is a gradual process that requires dedication and effort, but the benefits it can yield are invaluable.

During college, students can cultivate their professional networks, which can open doors to various opportunities such as internships, job placements, collaborative projects, mentorship, and coaching. Engaging with both peers and industry professionals fosters a sense of community and facilitates the exchange of ideas and perspectives. Through networking, individuals can gain valuable insights into different industries, career paths, and emerging trends, enhancing their understanding of the professional landscape.

Moreover, networking provides avenues for receiving career guidance and mentorship, which can play a crucial role in shaping one's professional development. By connecting with experienced professionals, students can gain valuable advice, support, and encouragement as they navigate their academic and professional journeys.

To cultivate practical networking skills, individuals should actively participate in various networking opportunities available during college, including workshops, conferences, industry events, student meetings, and networking functions. Additionally, presenting papers and engaging in discussions can help individuals expand their network and establish meaningful connections within their field of interest.

Ultimately, investing time and effort into building a robust professional network during college can significantly contribute to a smooth transition from academic life to the workforce. By nurturing these connections and leveraging them effectively, individuals can enhance their career prospects and seize new opportunities for growth and advancement.

5.7 Conclusion

The survey findings, existing research perspectives, and the discourse presented in this chapter highlight several key factors that emerge as critical drivers of successful school-to-work transitions. These factors include:

1. Industry Experience: A student's engagement in any form of internship within their chosen field provides invaluable real-world exposure and practical skills development.
2. Acquisition of Market-Relevant Skills: Students who actively seek out and acquire skills that the job market demands, even if these skills are not part of their academic curriculum, position themselves better for success in the workplace.
3. Development of Soft Skills: The ability to cultivate and refine soft skills, such as communication, teamwork, and problem-solving, during college fosters effective collaboration and adaptability in professional settings.
4. Strategic Approach to Campus Placements: Students who strategize, plan meticulously, prepare thoroughly, and execute a well-thought-out approach to campus placements are more likely to secure desirable job opportunities.
5. Establishment of a Professional Network: Building a robust network of contacts, both within peer groups and the industry, creates avenues for career advancement, learning opportunities, and personal growth.

These factors collectively contribute to a holistic and proactive approach to transitioning from academia to the workforce, equipping students with the skills, experiences, and connections necessary for success in their chosen careers.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

This research achieved its objective of identifying the factors that promote and inhibit successful school-to-work transitions among engineering students in India. It delivered significance by addressing the current gap in the school-to-work transition of Indian engineering students in literature. While several studies have been conducted on engineering education, policy, and faculty in India, there needs to be more when it comes to the school-to-work transitions of engineering students in India. Hence, this study is the first of its kind that identifies factors that promote and inhibit school-to-work transitions.

This study was conducted using a survey that was rolled out to engineering students who passed out between the years 2013 – 2022. A survey was conducted for the family members who supported engineering students while in college. The Training and Placement Officers (TPOs) were interviewed as part of the study.

The thesis delivered on the identified research objectives by:

- Exploring and identifying the factors that promoted success during the school-to-work transition
- Exploring and identifying the factors that inhibited success during the school-to-work transition
- Investigating the successes and failures the students faced during the school-to-work transition as well as college as observed by the TPOs and
- Exploring and identifying the factors that helped in school-to-transition from a family member's perspective

The research study has been restricted to the students who passed out of circuit branches, including computer science, information science, electrical engineering,

electronics and communications engineering, electrical and electronics engineering, and telecommunication engineering. The demographic analysis reveals a significant majority of participants aged between 21 and 29, with a notable portion aged 30-39. There is a noticeable gender disparity, with males comprising the largest group, followed by females. Geographically, participants were diverse, with a substantial number from urban areas, followed by rural, semi-urban, and metropolitan areas, and one participant from an international background.

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The research findings illustrate a varied economic landscape among Indian engineering students in terms of family monthly income. Different income brackets were represented, with some students choosing not to disclose their income. The categories ranged from higher income brackets to lower ones, with the smallest percentage falling in the lowest income bracket.

The educational backgrounds of fathers show that a significant majority have achieved University or higher education, while a slightly smaller percentage of mothers have similar educational attainment. This observation reflects the educational diversity among parents of engineering students in India. Regarding occupation, the majority of fathers are employed, with retired fathers forming a notable percentage. In contrast, a lower proportion of mothers are in paid jobs, with a significant portion not engaged in paid employment and retired mothers making up a small percentage of the sample.

Most respondents completed their engineering degrees in the past few years, with a significant portion graduating in the years 2020, 2021, and 2022, indicating a concentration of recent graduates in the sample. The vast majority of participants are currently enrolled in Bachelor's programs (B.E/B.Tech), while a smaller number are pursuing Master's programs (M.E/M.Tech).

The majority of participants exhibited strong academic performance, with a significant number achieving a grade of >=60% or a CGPA of 6 out of 10. In contrast, a smaller proportion concluded their programs with a lower grade or CGPA. A notable percentage of respondents completed their studies in the Computer Science branch, closely followed by the Electronics and Communication branch, indicating their prominence within the sample. Other specialized branches contributed relatively smaller percentages overall.

A considerable number of respondents managed to secure employment within the first year after graduation. At the same time, a smaller percentage did not find a job in that timeframe, and a significant proportion chose not to disclose their job-seeking status. A majority reported experiencing only one job change since graduation, with a notable group indicating two job changes. Smaller percentages reported three, four, or five job changes, while some chose not to respond to this question.

The consulting domain employs the most considerable portion of participants, comprising a significant percentage, followed by a smaller proportion in technology-related roles. Other sectors collectively employ a modest number of participants.

A majority of respondents reported engaging in internships during their academic tenure, while a notable percentage did not have such experiences. Among those who did participate, a significant proportion opted for either two-month summer internships or longer six-month semester internships. Some respondents embraced a combination of both

types, indicating exposure to diverse work environments, while a smaller fraction pursued other types of internships.

Respondents engaged in diverse internship activities, with a majority participating in project-related training and shadowing of work. In comparison, a substantial number were actively involved in project and product development work, demonstrating hands-on experience in real-world engineering projects.

The participants' internships have helped to promote comprehensive growth, encompassing various activities such as soft skill training, campus-to-corporate transition sessions, and internal projects, highlighting the significance of both technical expertise and soft skills. Participants also had the opportunity to delve into case studies, receive mentorship and coaching, and partake in research-related tasks. A significant portion of respondents expressed strong agreement regarding the role of internships in securing employment, with others also acknowledging this aspect. This point underscores a crucial insight relevant to Hypothesis 1: Any short or long-term internship promotes successful school-to-work transitions.

A notable portion of participants reported satisfaction with their current employment, while a smaller percentage expressed dissatisfaction. A considerable number neither affirmed nor denied job satisfaction, and a notable fraction still needs to respond to this inquiry.

The survey findings and data align with hypothesis 2, indicating a correlation between academic performance (achieving a grade of >=60% or a CGPA of 6 out of 10) and the lack of internship participation concerning job placement within one year of completing the engineering course. Notably, all respondents chose to refrain from responding to the job placement question in this specific context.

The information on the combination of courses impacting job placement highlights the significance of diverse skill sets. Proficiency in programming languages, such as Python, emerges as a crucial factor, according to a portion of respondents. Various combinations, such as Full Stack Development paired with Programming Languages and Website Development, showcase the range of skills considered advantageous for securing employment.

A significant portion of respondents credit their success to skills and knowledge gained directly from their college courses. At the same time, another considerable fraction identifies project work undertaken during their academic tenure as pivotal. Soft skills also play a significant role for a portion of participants. A smaller yet notable percentage acknowledges the importance of personal connections, such as family and friends, in securing employment, with a minor fraction attributing their job placement to general knowledge acquired outside the formal college curriculum.

The second survey provided

- insight into the need for improved student preparation for jobs,
- acquiring job-specific skills,
- training by the college, and
- alignment by the college for dynamic market situations.

Through conducting interviews with training and placement officers, this research aimed to gain comprehensive insights into various facets of placement trends within the academic context. These interviews provided valuable perspectives on evolving student aspirations and capabilities, shedding light on the expanding sectors participating in campus recruitment and the dynamic skill spectrum demanded by the market. Additionally, discussions delved into the shifting roles within industries, the significance of alum connections in placement processes, and the impact of industry collaborations and

partnerships. Furthermore, the interviews addressed the role of internships, the correlation between academic performance and placement outcomes, and the effect of the COVID-19 pandemic on on-campus placements. Overall, these interviews served as a rich source of information, offering nuanced understandings essential for advancing research in the domain of academic placement trends.

6.2 Implications

This research delineates factors influencing successful school-to-work transitions among engineering students in India, providing actionable insights for stakeholders. Addressing promoting factors and mitigating inhibiting ones is crucial for optimizing these transitions. The study offers practical implications, particularly for training and placement officers of engineering colleges. Recommendations encompass strategies to bolster internships, cultivate market-relevant and soft skills, refine campus placement preparation, and foster networking. By implementing these approaches, colleges can enhance factors conducive to school-to-work transitions. This research contributes to a holistic understanding of the transition process and equips stakeholders with tailored interventions to facilitate smoother transitions for engineering students, thereby fostering their career success.

Additionally, the study underscores the importance of collaboration between academia and industry to bridge skill gaps and align educational curricula with industry requirements. Training and placement officers play a pivotal role in facilitating this collaboration, fostering partnerships with companies for internships, guest lectures, and industry projects. Moreover, the research highlights the significance of adapting placement strategies to accommodate the challenges posed by the COVID-19 pandemic, such as virtual recruitment drives and remote internship opportunities. By incorporating these insights into their practices, training and placement officers can effectively support

engineering students in navigating the transition from academia to the workforce, ultimately enhancing their employability and career prospects in a rapidly evolving job market.

While the research delineated factors influencing school-to-work transitions, it did not explore their timing for evaluation or relative importance. Thus, the practical application lies in outlining a framework for successful transitions. The research suggests tailoring strategies to individual students, colleges, and situations, recognizing the multifaceted interaction of stakeholders, policies, and circumstances. This approach acknowledges the dynamic nature of transition processes and emphasizes the need for adaptable interventions aligned with varying needs and contexts.

This adaptable framework underscores the importance of continuous evaluation and adjustment throughout the transition process. By recognizing the nuanced interplay of factors and the evolving needs of students and institutions, stakeholders can effectively navigate the complexities of school-to-work transitions. Additionally, the research underscores the necessity of ongoing dialogue between academia, industry, and policymakers to ensure the relevance and responsiveness of transition strategies in a dynamic socio-economic landscape. Ultimately, the application of these findings can inform tailored interventions that optimize the transition experience, bolstering the employability and success of engineering students as they enter the workforce.

6.3 Recommendations for Future Research

Aside from the research suggested above, several other possibilities exist:

- The research unveiled various factors influencing successful school-to-work transitions, primarily driven by students' actions and decisions within engineering colleges. However, given the scope of the current research, the study did not delve into the timing of evaluating these factors' impact on transition success.

Considering that the transition extends until approximately age 30, optimal evaluation timings for each factor's influence may exist as students progress. Future research could investigate these dynamics, elucidating when and how promoting or inhibiting factors exert their effects on the transition process. Such insights would enrich our understanding of the temporal dynamics inherent in navigating the school-to-work transition, informing more targeted interventions and support mechanisms for students.

- While many acknowledge campus placement preparation as a critical factor in promoting successful school-to-work transitions, this study, given its scope, did not examine the specifics or quality of these preparations. A valuable avenue for future research is identifying and evaluating best practices in campus preparation models. By systematically analyzing the efficacy and implementation of these models, researchers can provide actionable insights for optimizing campus preparation strategies. This research would offer valuable guidance to both students and colleges, facilitating smoother transitions from academia to the workforce and enhancing overall employability outcomes.
- The research has provided limited representation of female students. Another potential study could explore in greater detail potential differences among factors affecting diverse groups of engineering students, such as females, persons with disabilities, marginalized communities, and LGBTQ+ individuals, regarding the challenges of school-to-work transitions.
- This research also focused on engineering circuit branch students who have opportunities to be employed by IT Service, Product, and Consulting organizations, which have seen a rise in the market. Another potential study could explore the

school-to-work transitions of other branches of engineering with fewer opportunities for students in the market.

Finally, the data revealed that several other undergraduate programs in the country remain popular despite the scarcity of opportunities. To advance knowledge in this area, researchers could utilize the findings from this study to design and identify factors that promote and inhibit school-to-work transitions among undergraduate students in India.

6.4 Conclusion

This research aimed to identify factors that promote and hinder successful school-to-work transitions. The findings affirmed that these transitions pose challenges for students, families, and colleges, with many students needing help to secure employment immediately after college. The insights gleaned from the findings offer guidance to support students, families, and colleges in enhancing transition experiences during college. While the challenge of school-to-work transitions is significant, there is encouraging potential for improvement, and this research aims to contribute to that endeavor.

APPENDIX A

SURVEY COVER LETTER

School to Work Transition Survey of Engineering Students in India

Welcome to School-to-work Transition Survey.

Thank you for participating in the school-to-work transitions survey. Your feedback is essential.

The school-to-work transition is the passage of a young person (aged 15 to 29 years) from the end of schooling to the first fixed-term or satisfactory employment. This transition is sometimes linear. A transition may be to a stable outcome or a temporary outcome regarding employment/paid work.

The researcher requests your consent for participation in a study about "FACTORS THAT PROMOTE AND INHIBIT SUCCESSFUL SCHOOL-TO-WORK TRANSITIONS AMONG ENGINEERING STUDENTS IN INDIA." This consent form asks you to allow the researcher to record and view the survey responses and to use your comments to enhance the researcher's understanding of the topic. The form also asks your permission to use related observations as data in this study.

Participation in this study is entirely voluntary. If you decide not to participate, there will not be any negative consequences. However, please be aware that if you choose to participate, you may stop participating at any time.

The researcher will maintain the confidentiality of the research records or data, and all data will be destroyed in 5 years.

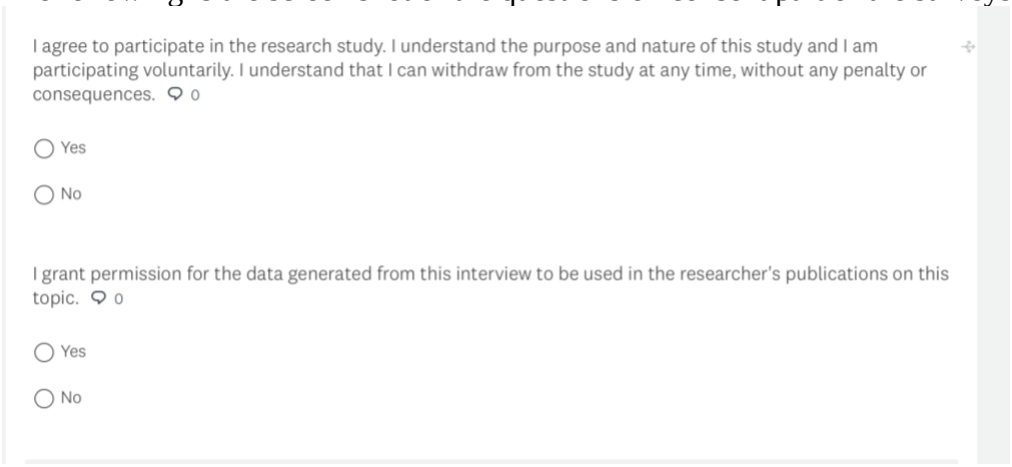
By submitting this form, you are indicating that you have read the description of the study, are over the age of 18, and that you agree to the terms as described.

If you have any questions or want a copy of this consent letter, don't hesitate to contact the researcher at kalyan.neriyanuri@gmail.com

APPENDIX B

INFORMED CONSENT

The following is the screen shot of the questions on consent part of the surveys:



APPENDIX C

SURVEY & INTERVIEW GUIDE

1. School-to-WorkTransition Survey Questionnarie

Survey Question	Response Options
What is your age?	17 or younger
	18-20
	21-29
	30-39
	40-49
	50-59
	60 or older
What is your gender?	Female
	Male
	Do not wish to disclose
	Other (specify)
What language do you mainly speak at home?	Assamese
	Bengali
	Bodo
	Dogri
	Gujarati
	Hindi
	Kannada
	Kashmiri
	Konkani
	Maithili
	Malayalam
	Manipuri (also known as Meitei)
	Marathi
	Nepali
	Oriya
	Punjabi
	Sanskrit
	Santhali
	Sindhi
	Tamil

	Telugu
	Urdu
	Some other language
At what email address would you like to be contacted?	Open-Ended Response
Please provide your LinkedIn profile address here	Open-Ended Response
In what country do you work/live currently?	Open-Ended Response
In what PIN code do you currently live? (enter a 6-digit PIN code eg if in India; for example, 560001 or 600036)	Open-Ended Response
Do you live and/or work in the city/town/village where you grew up?	Yes
	No
Describe your original place of residence (or place of you grew up)	Rural area
	Semi urban area
	Urban area
	Metropolitan area
	Another country
Any specific reason for your current residence?	I have not moved and have been living in the same place
	To accompany family, I have moved
	For education/training/apprenticeship/internship, I have moved
	To work / for employment-related reasons, I have moved
	Other reasons
What is the highest level of education of your father and mother?	Pick Education Level - Father - No schooling
	Pick Education Level - Father - Elementary education
	Pick Education Level - Father - Vocational education
	Pick Education Level - Father - Secondary school
	Pick Education Level - Father - University
	Pick Education Level - Father - Post-graduate studies
	Pick Education Level - Father - Other
	Pick Education Level - Mother - No schooling

	Pick Education Level - Mother - Elementary education
	Pick Education Level - Mother - Vocational education
	Pick Education Level - Mother - Secondary school
	Pick Education Level - Mother - University
	Pick Education Level - Mother - Post-graduate studies
	Pick Education Level - Mother - Other
What are the occupations of your father and mother? (select the main occupation of each parent)	Select the main occupation - Father - Professional, technical, and related worker
	Select the main occupation - Father - Administrative, managerial
	Select the main occupation - Father - Clerical and related worker
	Select the main occupation - Father - Sales
	Select the main occupation - Father - Agricultural worker
	Select the main occupation - Father - Factory/production worker
	Select the main occupation - Father - Government/public sector worker
	Select the main occupation - Father - Armed forces
	Select the main occupation - Father - Home-based worker/ subcontractor
	Select the main occupation - Father - Other service worker
	Select the main occupation - Father - Unpaid family worker
	Select the main occupation - Father - Housework
	Select the main occupation - Father - Student Unemployed/looking for work
	Select the main occupation - Father - Retired
	Select the main occupation - Father - Disabled
	Select the main occupation - Father - Parent deceased
	Select the main occupation - Father - Other
	Select the main occupation - Mother - Professional, technical, and related worker

	Select the main occupation - Mother - Administrative, managerial
	Select the main occupation - Mother - Clerical and related worker
	Select the main occupation - Mother - Sales
	Select the main occupation - Mother - Agricultural worker
	Select the main occupation - Mother - Factory/production worker
	Select the main occupation - Mother - Government/public sector worker
	Select the main occupation - Mother - Armed forces
	Select the main occupation - Mother - Home-based worker/ subcontractor
	Select the main occupation - Mother - Other service worker
	Select the main occupation - Mother - Unpaid family worker
	Select the main occupation - Mother - Housework
	Select the main occupation - Mother - Student Unemployed/looking for work
	Select the main occupation - Mother - Retired
	Select the main occupation - Mother - Disabled
	Select the main occupation - Mother - Parent deceased
	Select the main occupation - Mother - Other
What is the number of persons in the household where you live? (include yourself)	1
	2
	3
	4
	5
	6
	>6
On average, what is the total income of your household per month?	<= INR 25,000
	> INR 25,000 and <= INR 50,000
	> INR 50,000 and <= INR 75,000
	> INR 75,000 and <= INR 100,000
	> INR 100,000 and <= INR 125,000

	> INR 125,000
How many persons in the household work for a salary/wage?	Open-Ended Response
Do you identify as a person with a disability?	No
	Do not wish to disclose
	Yes (please specify detail)
What is your current marital status?	Never married
	Engaged to be married
	Married
	Divorced /Separated
	Windowed
What is the highest level of qualification you have	B.Tech/B.E
	M.Tech/M.E
	Other
	For any other qualification, please specify here
PIN code of the college/institution studied	Open-Ended Response
Name of the college/institute	Open-Ended Response
Website of the college/institute	Open-Ended Response
Year of Passing	2023
	2022
	2021
	2020
	2019
	Other (please specify)
Which Branch of Engineering did you study?	Computer Science
	Information Science
	Electronics and Communication
	Telecommunications
	Electrical Engineering
	Electrical and Electronics
	Instrumentation
	Other (please specify)
Please select the final % of marks or CGPA in your engineering course.	completed with >= 60% or 6 out of 10 CGPA
	completed with <60% or 6 out of 10 CGPA
	Other way of passing without % or CGPA (please specify)

Duration of the internship	There was no internship in my course
	Summer - approximately 2 months
	Semester - approximately 6 months
	both summer & semester
	Other (please specify)
Did you receive a monthly stipend during the internship?	No
	Yes (please specify how much)
Organization(s) with which you did internship	Open-Ended Response
What was part of your internship (Check all the apply)	Campus to Corporate transition sessions
	Project related training
	Soft skill training
	Case studies
	Shadowing of work
	Project/product development work
	Mentorship
	Coaching
	Internal projects
	Research related work
	Other (please specify)
Do you believe that internships have helped in finding the job/work that you were looking for immediately after college?	Strongly agree
	Agree
	Neither agree nor disagree
	Disagree
	Strongly disagree
Were you placed on a job through campus placements or found paid work/job outside campus placements or started your own business immediately after or within 1 year after college?	Yes
	No
Which are the courses that have helped in securing a job/work?	Full stack development
	Data Science
	Artificial Intelligence
	Digital Marketing
	Programming Languages (eg. Python)

	DevOps
	Block Chain
	Website Development
	Machine Learning
	Other (please specify)
What has helped you the most in securing a job/starting your own business?	Skill/knowledge gained out of college course
	Project work that was done
	General knowledge
	My family/friends' connection
	Soft skills
	Other (please specify)
Number of paid jobs that you have changed in your career so far, including first job	1
	2
	3
	4
	5
	>5
Name of the organization that you are currently working with	Open-Ended Response
About how long have you been in your current position?	Years
	Months
Which of the following best describes the IT job role that you are already in or wish to aspire for?	Database Specialist
	Hardware Specialist
	IT Administrator
	Mobile Specialist
	Networking Specialist
	Programming Specialist
	Software Specialist
	Technical Writer
	Web Specialist
	Other (please specify)
You believe that you are in the career path you have chosen since your college days.	Strongly agree
	Agree

	Neither agree nor disagree
	Disagree
	Strongly disagree
Your satisfaction regarding the job/work that you do	Very satisfied
	Satisfied
	Neither satisfied nor dissatisfied
	Dissatisfied
	Very dissatisfied
What is the primary reason you believe you did not get placed/secure a paid job/work after college?	Lack of adequate technical job skills
	Lack of adequate soft skills
	Lack of systematic approach for a securing a job/work/starting a business
	Did not apply/look for work while in college due to self/family health reasons
	Did not apply/look for work during college for other reasons
	Lack of support to provide equity to diversity/disability
	Other (please specify)
Could you find paid work/employment after you left college?	No
	Yes (please specify after how long and name of the company)
Did COVID impact your job/work or an opportunity after college?	Yes
	No
In what way has COVID-19 impacted you negatively in your job or transitioning to a job/work?	I did not get paid job/work immediately, though I was prepared to take up a job/work
	Campus placements were minimal than usual years
	I had challenges coping with myself that were COVID induced
	I had to attend to family responsibilities that were due to COVID
	Skill/knowledge building through college courses slowed down due to moving to an online medium.
	Lack of in-person interaction significantly impacted my securing paid work.
	I lost my job during COVID due to down-sizing or closure

	Because of remote work, my stress levels went up, affecting my wellbeing
	Lack of in-person connections with people impacted me, and I am still recovering
	Minimal or no impact
	Other (please specify)
Please share any comments, questions, or challenges you faced during your school-to-work transition. You may also choose to write general comments about this survey as well.	Open-Ended Response

2. The training and Placemment Officer Interview Questions

Interview Questions
Date & Time of the Interview
Consent for publishing the responses in research given
1. What is your overall satisfaction with the effectiveness of campus placements since 2013? (Very Satisfied, Satisfied, Neutral, Dissatisfied, Very Dissatisfied)
2. Which three factors do you believe have contributed to the success or failure of campus placements? (Quality of student preparation, Industry Demand, College Networking, Placement cell effectiveness, Alumni Support, Other)
3. Campus Placement Trends: How would you describe the overall trend in campus placements at your engineering college since 2013?
4. Campus Placement Trends: Can you provide an overview of the total number of companies participating in placements each year and how it has evolved?
5. Variation in Placement Sectors: Have you observed any significant changes in the sectors or industries participating in campus placements over the years?
6. Placement Success and Challenges: Can you highlight some challenges or obstacles faced by your students in the placement process and how the college has addressed them?
7. Impact of Industry Trends: How have changing industry trends influenced the types of job opportunities available for your engineering graduates?
8. Role of Alumni Engagement: In what ways has the engagement of alumni contributed to the success of campus placements?
9. Adaptations Due to Technological Changes: How has technology, such as virtual recruitment processes, impacted the dynamics of campus placements?
10. Feedback Mechanisms: How does the college gather feedback from both students and recruiters about the placement process?
11. Collaborations and Partnerships: Have there been any collaborations or partnerships with industry players to enhance placement opportunities for your students?
12. Preparation Initiatives: What initiatives has the college undertaken to prepare students for the placement process, including workshops, training programs, or industry interactions?
13. Internship & Placements: Are there any specific observations you want to make on either internships or lack of internships and placements at your college?

14. Academic Performance & Placements: Are there any specific observations you want to make on either academic performance (Completed with >= 60% or 6 out of 10 CGPA) or lack of academic performance and placements at your college?
15. COVID-19 & Impact on students: Any specific observations you want to make on the impact of COVID-19 on academics and placement during the years 2020-2022.

3. Family Member Survey

Survey Question	Response Options
Your relationship with the engineering student in the context	Father
	Mother
	Brother
	Sister
	Other (please specify)
Which year did your family member in the context pass out of Engineering course?	2013
	2014
	2015
	2016
	2017
	2018
	2019
	2020
	2021
	2022
	Other (please specify)
Select the engineering branch studied by your family member.	Computer Science/Engineering
	Information Technology/Systems
	Electronics and Communication
	Electrical Engineering
	Electrical and Electronics Engineering
	Tele communications
	Other
What was the primary goal when your family member in the context joined the engineering course?	Gain Knowledge and Skills in the subject
	Academic Excellence in the chosen branch
	Placement in Reputable Companies

	To start a company/business or support family business
	To pursue higher Education in India
	To pursue higher Education abroad
	Other (please specify)
Did you feel adequately informed about the prospects for engineering students in India when your family member started college?	Yes
	No
What type of support did you find most helpful in assisting your family with their school-to-work transition?	Career counseling
	Internship opportunities
	Networking events
	Resume building workshops
	Other
Was your family member in the context able to make a living through earning within one year of completion of their coursework?	Yes
	No
	Other (please specify)
What is one factor that greatly supported the school-to-work transition of the family member in the context?	Not Applicable
	One factor that greatly supported (please specify)
What is the biggest challenge faced post-college by the family member in the context?	Not Applicable
	Challenge faced (please specify)
What are the biggest challenges you faced in supporting your family member in the context of his/her college years?	Open-Ended Response
How satisfied are you with the current job market opportunities for engineering graduates in India?	Very satisfied
	Satisfied
	Neutral
	Dissatisfied
	Very dissatisfied
Do you believe that there is a need for an explicit resource portal that would help family members support their wards in their school-to-work transition?	Definitely yes
	Probably yes
	Not sure

	Probably no
	Definitely no
What additional support or resources do you think would have been beneficial to ease the school-to-work transition for your engineering student?	Open-Ended Response

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