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

A Research Proposal

Presented

by

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Submitted to the Research Committee at the

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# ABSTRACT

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

Engineering is one of the most popular streams of education in India for several decades now. India provides a global workforce for the design, development, and maintenance of products and services in the Information Technology/Information Technology Enabled Services industry for which engineering education plays a pivotal role. However, there has been a gap between the education/knowledge/skill that the colleges provide to that of the expectation of training/skills that are needed by the industry. While the gap is currently being bridged by students taking courses to post their engineering degree before they take up full-time employment, the study aims to identify the factors that promote and inhibit smooth school-to-work transitions among engineering students in India.

Directed by: DR. ANNA PROVODNIKOVA

Table of Contents

[ABSTRACT v](#_Toc103318545)

[CHAPTER 1 7](#_Toc103318546)

[Introduction 7](#_Toc103318547)

[CHAPTER 2 10](#_Toc103318548)

[Problem Statement 10](#_Toc103318549)

[Internships and School-to-work transition 10](#_Toc103318550)

[Academic Performance and School-to-work transition 11](#_Toc103318551)

[CHAPTER 3 12](#_Toc103318552)

[Objectives 12](#_Toc103318553)

[CHAPTER 4 14](#_Toc103318554)

[Preliminary Literature Review Objectives 14](#_Toc103318555)

[CHAPTER 5 22](#_Toc103318556)

[Methodology 22](#_Toc103318557)

[Purpose of study 22](#_Toc103318558)

[Research Questions 22](#_Toc103318559)

[Study Population 23](#_Toc103318560)

[Population justification 23](#_Toc103318561)

[Sources of Data 23](#_Toc103318562)

[Research Procedure 24](#_Toc103318563)

[Soliciting Participants 24](#_Toc103318564)

[Informed Consent 24](#_Toc103318565)

[Data Collection Procedures 24](#_Toc103318566)

[Ethical Considerations 25](#_Toc103318567)

[Considerations during data collection 25](#_Toc103318568)

[Considerations of Researcher Bias 25](#_Toc103318569)

[BIBLIOGRAPHY 26](#_Toc103318570)

# CHAPTER 1

## Introduction

It is a known fact that any transition in life is never easy. Be it a life event, college to work, a new job role, or a career transition from one field to another. Every change during the transition requires understanding, preparation, initiation, and support to make them meaningful, successful, and satisfactory. One needs to prepare for any transitions by developing the skills and knowledge to apply them in each context.

One of the keys to financial independence in life is the ability of an individual to move to work after school/college. It also helps the economic growth of the world. The work which provides meaning and purpose would lead an individual to get more engaged, thus helping to pursue a purposeful, happy, and satisfying career. Some of the school/college programs offer up-to-date skills, knowledge, and industry exposure supports the students for an active transition from school to work. The industry engagement with academia in providing visibility to its needs on skills and knowledge in days/years to come and an opportunity for individuals to have first-hand experience of work while at college. This kind of interaction between industry and academia will help develop effective programs at schools/colleges.

School-to-work transition refers to all the activities, programs, processes, and training designed for students to start their careers. While what an individual learns right from the early years of education helps in the workplace, the learning in the last few years in the school/college matters the most for a smooth workplace transition and career direction in the initial phase. Hence the preparation for the workplace becomes a topic of research interest both globally as well as country-wise with the changing job market, economy, government policies as well as individual preferences based on the motivations, societal changes, and perceptions. The research in the area also helps in designing school/college programs that effectively prepare students for work, assessing the effectiveness of the existing programs, and theoretical models that would form the basis for further improvements.

Many of the organizations in the industry are reducing the qualifications for the jobs needed (Fuller et al., 2022) for the middle-skill positions with skill-based hiring going up. To quote from the article “Between 2017 and 2019, employers reduced degree requirements for 46% of middle-skill positions and 31% of high-skill positions”. The entry-level selection process is being redefined with organizations introducing Artificial Intelligence-based recruitment, recruitment through online channels, video interviews, recruitment for soft skills, and using gamification to help in finding the right candidates for the jobs as the demand and supply equations are not matched and what is taught in the colleges is not up to date for the needs of knowledge/skills for the jobs (Human Capital, 2021). This is a worldwide phenomenon being seen in several countries.

There has been a constant need to revise and revisit the courses offered at the universities and engineering institutions to make them more relevant to the industry. There is a gap between the industry and academic courses from the skill readiness point of view as there is a need to get additional training for engineering students in India (Büth et al., 2017). This calls for tremendous agility, flexibility, and speed with which the academic institutes need to act to meet the industry needs.

In the months of February and March 2021, 1.2 million students had registered for writing the Joint Entrance Examination for B.E./ B.Tech. Paper 1, which is considered one of the sought-after assessments conducted by the National Test Agency (Ministry of Education, Government of India), for admission to engineering colleges in India (NTA, 2021a) (NTA, 2021b). According to the website (AICTE, 2022) of the All-India Council of Technical Education (AICTE), the Government of India body, an average of 746,466 students enroll in the engineering program, and 367,384 get placed on campus during the last years based on the data given in the table below:

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

While the gaps exist between what skills engineering institutions in India offer to that of what industry needs, there are several students who complete the smooth school-to-work transitions by launching their careers. This indicates that there are factors that seem to promote and inhibit smooth school-to-work transitions given everything else to be equal between the students. This research project will identify factors that promote and inhibit smooth school-to-work transitions among engineering students in India. In addition, it will propose a conceptual framework for engineering courses to improve employability.

# CHAPTER 2

## Problem Statement

A smooth School-to-work transition can be defined as the continuous engagement of a student in a paid job for the first 3 to 5 years after completion of school/college without being unemployed because of a lack of skills needed and the student applying the knowledge and experience that has been gained in the previous years.

There have been studies on the need for vocational education or courses part of the academic curriculum for improved school-to-work transitions (Neumark, 2007).

In India, engineering is a popular stream of study for many young people as it has provided jobs in the growing sector of Information Technology and IT Enabled Services. Preference will be given by IT and IT enabled service companies to students who graduate from what is called the circuit branches which are offered by the Department of Computer Science, Information Science, Electronics, Electrical, and Instrumentation. According to Statista (Statista Research Department, 2021a), 3.2 million students have enrolled in 5 disciplines of engineering in the year 2019. It also gives another alarming statistic that 46.58% (Statista Research Department, 2021b) of engineering graduates were unemployed in 2021.

### Internships and School-to-work transition

The scope of the current study on school-to-work transitions is limited to the engineering students in India from the circuit branches. Industry exposure is gained by the students through the opportunities they get to connect to the industry through various forums and means. Some of the colleges facilitate the industry connection through industry talks, conferences, panel discussions, Industry expos, Industry days, and a range of internships. This exposure plays a critical role in the job search. One of the key impediments for engineering students in India is the lack of industry exposure (Wilson and Deep Singh, 2020). While there are several theoretical, practical courses and projects, many colleges provide opportunities for industry internships in the form of short (2 months) or long (6 months) assignments in an 8-semester engineering course.

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

### Academic Performance and School-to-work transition

There has been a decline in the number of students graduating vs the number of students placed(Neelam Pandey, 2018) . Given the evolving skill demand in the market, there is a constant gap between academic courses offered at the colleges and the needs of the industry. Hence academic performance is no longer an indicator of smooth school-to-work transitions.

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

This study once completed should advocate the need for 2 important changes:

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

# CHAPTER 3

## Objectives

There are several stakeholders who influence school-to-work transitions. Here are a few:

**Students**: Students are those who are undergoing the transition from school to work. The personality of the student, attitude towards the job, preparation for the job search, and proactiveness to reach out for support play a vital role in school-to-work transitions. This is in addition to knowledge and skills gained during the college and the individual ability to establish command over the same in a short span of the selection process. The behavior of the students during the job also plays a significant part in smooth school-to-work transitions.

**Family/Friends**: A student’s family (parents, siblings, extended families), as well as friends, influence the overall choice of final job post the school.

**School/College/Institute**: School/college/institute a student studies plays a very important role in shaping up a student for life. Based on the reputation & culture it is known for, it provides an environment in which the student can let go, aim for or take up a challenge to surpass their own expectation for starting a career. This could come from the history of placements, support by the placement department, training offered, industry exposure, facilities provided, library, labs, support from the faculty, and finally the peer group and their ambitions.

**Employers**: Employers have their own brands based on the clients they work with, products and services they provide, the domain expertise they are known for, working culture, and finally the compensation they provide. Based on several parameters, a college provides a specific slot for employers to recruit campus students. An employer also prefers to recruit from a college based on their experience with the students recruited from the college and their performance. There is a continuous 2-way pull and push to choose the employer by the college as well as the college giving a better recruitment slot to the employer.

**Economy**: State of the economy or economic development plays a key role in the job market, especially fresher jobs. The business environment plays a pivotal role in economic development. It also depends on the country’s ability to adopt the technology. Economic development also depends on the ability to raise the rate of human capital both physical and human capital. Economic development is influenced by a number of factors like economic, political, social, technological, administrative, and natural.

**Government Policies**: Government labor policies play a critical role in the job market as they influence the interaction between supply and demand. Government policies education, skilling as well as proactive engagement to build the skills for the future through the programs and infrastructure can make a huge difference in creating the needed workforce in the country.

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

The sub-objectives of the proposed research are:

1. A framework for colleges to support smooth school-to-work transitions.
2. A 10-step guide for students that would significantly help them to prepare for school-to-work transitions.

# CHAPTER 4

## Preliminary Literature Review Objectives

In this preliminary literature survey, research work done on the school-to-work transition from the Indian point of view has been reviewed as well as the studies conducted around the world on the school-to-work transitions in different dimensions.

School-to-work transition research has been of interest across the world. In India, particularly engineering education and the student’s ability to start the careers is of interest for various reasons. Engineering Education provides knowledge and skills for students. However, a study on employability skills to empower engineering students (Ajit et al., 2021) concluded that the need of the hour is to provide a training program that considers real-project scenarios as a priority to apply the theoretical knowledge gained which is lacking in the current curriculum. The study also emphasizes the need to ensure the curriculum of training is in line with that the career aspirations of the learner. Finally, the study, deduces that learners should develop generic skills that are transferable, improve the quality of skills and highlight the same in the resume in addition to their degree for fetching a decent job from the employers.

In a forward-looking article on the future of engineering education in India (Rao, 2014), the author puts forward the following changes and challenges the future engineers will face in years to come:

* The proliferation of knowledge: The speed at which the new knowledge is being added since the beginning of the century is mind-blowing.
* Technological Developments: There has been significant multi-disciplinary development across engineering that has paved the way for the convergence of technologies. Hence the engineers can no longer stick to a discipline but start the interactions with other disciplines.
* Globalization: The cultural adaptiveness of engineers is a must since companies around the world compete globally for products, markets, and resources.
* Concern for Environment and Sustainability: The need to cooperate with nature rather than control it has been like never before given the damages that have been seen because of engineering advancements in the last century. Companies are doing a paradigm shift in bringing the triple bottom as their focus: Profit, People, and Planet. Hence it will be mandatory for engineers to adopt green technologies for addressing engineering/social problems alike.
* Corporate Social Responsibility: It becomes imperative to think and address the impact that the industry will create proactively. Hence being socially responsible will be a key measure for engineers and organizations.
* Abrupt changes: There have been dramatic changes in social and economic factors due to factors like terrorism, economic crisis, war-like situations, and, social upheaval. These changes will continue in one form or the other hence engineers need to acquire skills to anticipate and address these situations.

Because of the evolution of the education system over the last 70+ years in India post-independence as well as the informal skill sector dominating the employment and labor markets a single study is not able to provide a comprehensive understanding of the school-to-work transitions. Pilz (2018) provided macro (educated vs uneducated population, general vs vocational education, structure vs chaos programs, supply vs demand-driven approach, and, public vs private financing), meso (adequate vs inappropriate curricula, short vs long-duration programs, and, competent vs unqualified teachers/trainers), and, micro-level (theory-driven vs practical experience, and, teacher vs learner-centered approach) analysis to drive home few opportunities and obstacles in India’s school-to-work transitions. The author called out the need for improving the governance and development of the Indian education system through the multi-dimensional approach in an interconnected and coordinated way, a lack of which may lead to the risk of single initiative and partial modifications resulting in unexpected side effects. The author also called out the need for encouraging young researchers, comprehensive knowledge of education and the labor system as well as a scientifically sound approach to educational planning.

All India Council for Technical and Engineering Education (AICTE) is a body that regulates engineering and management education in India. AICTE has commissioned a study to report the state of engineering education in 2018. A very radical report to shake up engineering education titled “Engineering Education in India – Short & Medium Term Perspectives” (Mohan Reddy, 2018) has provided a critical view of the current situation with engineering education in India and provided recommendations. Here are a few of them paraphrased relevant to the current discussion:

* The report recommended that no additional seats are approved in traditional engineering areas (Mechanical, Electrical, Civil, and Electronics engineering capacity utilization around 40%), but institutions need to be encouraged to convert current capacity in traditional disciplines to emerging new technologies (Computer Science and Engineering, Aerospace Engineering, Mechatronics capacity utilization being in the high 60%).
* In order to improve the poor employability of the engineering graduates which is reflecting poorly on the faculty – shortage, quality, and pedagogy, a recommendation was given on faculty development programs on new technologies, an industry-focused visit to faculty, and, mandatory certification of education for the faculty.
* The report recommended that the students be given the flexibility to use MOOCs (Massive Open Online Courses) in their core and optional curricula to overcome the quality faculty shortage.
* The report recommended a process for periodic industry feedback to improve the technology up-gradation in academia to ensure skills are put in place for future job roles.
* To improve the industry-academia interaction, the report recommended the use of analytical tools to understand the various teaching methods helping integrate pedagogy with apprentices, and rigorous implementation of mandatory apprentice (starting with 25% moving to 100% in five years).
* The report also recognizes the growth of artificial intelligence (AI), internet of things (IoT) embedded SW, internet SW, mobility, analytics, and cloud as compared to traditional technologies. The report recommended that the emerging technologies are made part of the curricula across disciplines and made mandatory for circuit branches. The report also recommended that new undergraduate engineering programs be created which are exclusively focused on AI, IoT, Blockchain, Robotics, Quantum Computing, Data Sciences, Cyber Security, 3D Printing & Design, AR/VR (Indicative list).
* To give the student-centric learning precedence, the report recommended that the students be encouraged in design thinking and practical approaches to learning. It also recommended the need to expose the students to the capability of the technology to solve real-life socio-economic problems.
* The report also recommended open book examinations be introduced wherever applicable as it helps move students to higher-order cognitive skills.

Being ethical is very important for one to make a successful career and school-to-work transition is the first step for the same. In a paper that provides an ethics and stakeholder perspective on engineering education (Mohan et al., 2015), the authors provide a review of engineering education, key stakeholders including regulators, Management, students, and faculty with their expectations who play important role in the development of the institute and the students. The authors also suggest ideas on how all these stakeholders could contribute to making engineering education more interesting and entrepreneur-oriented. The authors conclude on the need for engineering students to be ethical which helps to increase the importance of engineering education and ethical values while working with the current technologies and industrial and social needs.

Technical faculty play a key stakeholder role (Mohanty and Dash, 2016) in school-to-work transitions for engineering students. Emerging job markets universally prefer challenging skills like science, technology, engineering, mathematics (STEM), statistics, and data analysis. There is a major shift in the customer relationship and business strategy with new business models emerging in education/commerce with online consumers and learners hence there is a need for education. i.e., infrastructure, content/domain knowledge, educators/HR trainers. This calls for effective professional development both for new and experienced engineering technical faculty through redesigning curricula, pedagogy, and, mandatory training in the areas of innovative approaches to teaching and learning.

The rest of the section reviews the research work on the school-to-work transition outside India.

In an investigative work, Granato (2018) brought out “Gender Inequality and Scarring effects in school-to-work transitions” in Italy. The author found that the gender wage differentials can be explained by treating the content in the college degree course as a key variable. For example, a woman with a low math degree accounted for 13 to 16% of the wage gender gap. The author established that 50% of the wage gender gap is due to the Math and Science content in high school. The author also analyzed the extent to which demand and supply skills mismatch at the time of labor market entry affect careers.

Researchers have contributed several papers, books, and journal articles on the school-to-work transitions in the Netherlands. In one such book, Dumhs (Dumhs, 2019) provided several insights into the school-to-work transitions of vocational students in the Netherlands. The author made a strong case for how students' job search efforts and job search success get influenced by in-school mentors coaching and coaxing. The author established the importance of expectations for early labor market experience to overcome the ethnic reservation wage gap among Dutch vocational students. The author discussed the impact of resources and in particular financial resources on the school-to-work Transition via side jobs and pocket money.

A study (Kim and Lee, 2018) was conducted to identify the resilient students in the school-to-work transitions by taking input via surveys twice 6 months apart for the final year graduate students. Students were categorized into four groups, namely, resilient, semi-challenged, competent-unchallenged, and maladaptive based on the stressors and adaption. It was found that cognitive emotion regulation strategies such as strategic planning, positive refocusing, and restructuring the situation with optimistic points of view by the resilient group when compared to the maladaptive group. It was also found that career satisfaction was at a higher level for the resilient group than for the maladaptive group after 6 months.

There is no question that there is an influence of peer relationships when it comes to school-to-work transitions. In one such elaborate study (Rüschoff, 2015) there is a detailed treatment of addressing the influence of peer relationships on school-to-work transition. The author addresses the following four research questions in the study:

* How do interpersonal goals and relationship experiences with peers affect individuals’ work values at the transition to work?
* Does an efficacious peer network contribute to individuals’ engagement in career-directed behavior and the outcomes thereof during and after the transition period?
* How does the onset of employment relate to individuals’ engagement in delinquent behavior in different age groups throughout adolescence?
* What are the types and behavioral associations of peer status at the threshold of the transition from school to work?

The author concludes on the need for closer attention to social relationships with peers when seeking to understand young people’s transition from school to work. The author also emphasizes the importance to acknowledge that young people’s career decisions and behaviors do not take place in isolation but are developed in interactions with significant others – in this developmental period often their peers.

In another investigation (Ruschoff et al., 2018), young people’s peer networks were studied to correlate how they can be an asset in finding employment in school-to-work transitions. It inspects to identify the association between the number of applications completed and job offers received by a person with that peer network size and peers’ self-efficacy regarding their own job search. It was found that there is a positive association of peers’ efficacy beliefs with young people’s engagement in job search activities specifically on a greater number of applications completed. It was also found that that same is indirectly associated with their job search outcomes in terms of several offers that are independent of the peer network size.

With this preliminary literature review one can conclude that the research work on the School-to-work transition has a very broad scope, several dimensions, factors that promote and inhibit the smooth transitions, country specific nuances, student diversity angle and last but not the least personality of the individual. In particular there has been work on the engineering school-to-work transition in India more from an education system, process and stakeholder perspective.

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# CHAPTER 5

## Methodology

In a quantitative as well as a qualitative exploratory study, the research aims to identify the factors that promote and inhibit smooth school-to-work transitions among engineering students in India.

## Purpose of study

A smooth school-to-work transition plays a very important role in one’s career. Engineering Education in India is amid the transition shedding its image of outdated education to that of an open, progressive, modern, ready to meet the needs of changing demands of the job market. Given the breadth of the differences between the engineering colleges with respect to admission procedures, popularity, demand, infrastructure, qualified and effective faculty availability, industry interface, industry exposure provided, and placement opportunities it will be of great interest to study the factors that promote and inhibit smooth school-to-work transitions. This study aims to identify the factors that would support smooth school-to-work transitions as well as highlight factors that inhibit smooth school-to-work transitions.

## Research Questions

1. What are the factors that promote the engineering student's smooth school-to-work transition in India?
2. What are the factors that inhibit the engineering student's smooth school-to-work transition in India?
3. What is the correlation between internships (4 weeks to 6 months) and engineering students' smooth school-to-work transition in India?
4. What is the correlation between academic performance (75%+ marks or a Cumulative Grade Point Average of 7.5 on a scale of 10) and engineering students' smooth school-to-work transition in India?

## Study Population

To conduct the study 20 engineering colleges will be identified across India considering their geographical locations based on criteria of ranking and college density. From each college, 50 students from alumni will be identified thus totaling to1000 students. 400 of these students will be from the year of passing out 2016, while 300 will be from the year of passing out 2018, and 300 will be from the year of passing out 2020.

## Population justification

Colleges will be identified across the top, medium, and bottom ranking, as well as the students, will be coming from previous year batches to understand the stage of smooth school-to-work transition that they are in. This covers the needed broad spectrum of students passing out from different colleges.

## Sources of Data

Data will be collected using the survey/questionnaire from the identified population of students. There will also be a set of 100 interviews done with the students. There will be identified number of interviews that will be done with the training and placement officers of the colleges as well as parents/family members of the students.

## Research Procedure

### Soliciting Participants

As part of the research identified colleges will be approached for alumni student information providing the information on the objective of the research. Social media platforms like LinkedIn platforms will be used to reach out to the students from the identified colleges as well. The training and placement officers will be reached out based on the information provided on the college websites. Parents/family members will be reached out based on the information provided by the alumni students.

### Informed Consent

Once the population is identified informed consent will be taken using the tools like Google Forms/Survey Monkey to ensure that they are aware of the intent and the usage of the data that they will be providing for the study.

### Data Collection Procedures

Once approval and consent are received, information will be sent to the participants reaffirming the aim of the study. They will be assured that their participation in the study will support identifying the factors that promote and inhibit smooth school-to-work transitions thus helping the next generation of students. The participants will be asked to respond to the surveys that will be rolled out using online tools like google forms/survey monkey. All the interviews will be conducted in-person, via google hangout, or via zoom, and their responses recorded.

## Ethical Considerations

It is essential that the study is conducted ensuring all ethical considerations are taken care of. College alumni students who will be part of the study will be chosen at random, however, the year of passing is considered during this selection process. Participation in the survey is voluntary and no influence will be used on the participants to respond.

### Considerations during data collection

The name of colleges, alumni students, parents/family members, and the training and placement offices will not be published to ensure their identity is preserved. The surveys/questionnaires as well as the recordings of the interviews and transcriptions will not be named.

### Considerations of Researcher Bias

The goal of the research is to identify factors that promote and inhibit smooth school-to-work transitions among engineering students in India. Adding value to the next generation of students by collecting what they can do beforehand for a smooth school-to-work transition is the very objective of this research. During this process, the study does not intend to single out a particular college based on its ranking, geographical location, responses, or practices and instead will summarize the entire study's findings.

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