Unravelling the Peculiarity of Dropout Trends in Indian University Engineering Programmes: Insights Inspired by the Movie 'Three Idiots'

Lim Keai

Abstract

This study was inspired by the Indian movie ‘Three idiots’ and purposed to investigate the reasons behind the high rate of engineering degree programmes dropouts in India. Accordingly, factors related to academic, demographic, economic, family, future, institutional, personal, and social were derived and examined on their impacts on student attrition rate. The study addressed two fundamental questions: what factors contributed to the high dropout rate, and how could the likelihood of a student dropping out of the programme be predicted? The research involved 101 participants who were familiar with or had gone through the Indian education system. The collected data were first checked for validity and reliability using Confirmatory Factor Analysis (CFA) with SmartPLS before conducting Multiple Linear Regression analysis to compare various factors between students who persevered and those who dropped out. The results indicated that academic, institutional, and social factors significantly influenced student attrition rates, although individual students' reasons for dropping out were unique and varied.

Keywords: Confirmatory Factor Analysis, CFA, engineering dropout rate, Three Idiots, Retention, Predictive Model

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Introduction

Background

The popular Indian movie *Three Idiots* set in 2009 highlighted the popularity of engineering as a career choice in India, leading to an increase in the number of engineering institutions available (Times of India, 2017). In 2006 alone, more than 23,000 students graduated with an engineering degree. This trend may be attributed to personal aspirations or societal pressure from family, friends, and the larger community. However, prestigious Indian engineering institutions like the Indian Institutes of Technology (IITs), National Institutes of Technology (NITs), and Indian Institutes of Information Technology (IIITs) have a rigorous selection process, admitting only the most qualified students due to limited availability (Banerjee & Muley, 2006), resulting in intense competition and stress among applicants. The JNT University (India) reported that an average of 4,800 students dropped out of university engineering programs annually in 2009, and 5,200 in 2011, representing 3 to 4% of students. According to the All India Council for Technical Education (AICTE), the dropout rate for engineering programs in India is around 45% (AICTE, n.d.). University management cited the inability to handle the academic demands of the program as one of the primary reasons for the high dropout rates. Hence, this study was inspired by the movie *Three Idiots* to identify and verify the various factors contributing to the high dropout rates in engineering degree programmes to improve student retention.

Statement of Problem

The phenomenon of 'dropout' in universities refers to students who discontinue, fail or are unable to complete their enrolled studies or courses (Erben, 2005; Hernández, 2008). While previous research has explored the reasons behind the high dropout rates in universities (Bound

et al., 2010; Bowen et al., 2009), minimum research frameworks or predictive models were developed to forecast the likelihood of a student not completing their studies. To address this gap, the university requires a framework or system to predict the potential dropout rate of their engineering students by studying both internal and external factors such as student characteristics, faculty members' proficiency, peer pressure, and family expectations. By understanding the student experiences and developing effective interventions and support systems, the university management may counteract this phenomenon and increase the retention rate of engineering students.

Preliminary Research Question

This study aimed to address the issue of student dropout in an engineering degree program. Prior research has mainly focused on identifying the relationship between specific reasons (variables) and dropout rates. To build on this, the current study seeks to develop a predictive model by integrating multiple independent variables (reasons or factors) to forecast university dropouts. The research questions guiding this study are:

- What are the most significant internal and external factors that influence student dropout rates in an engineering degree programme, and how can these factors be integrated into a predictive model for dropout risk assessment?
- What combination of student characteristics, academic performance, social and cultural factors, and institutional policies and practices are the most accurate predictors of dropout risk in an engineering degree program, and how can this knowledge be leveraged to support student retention efforts?

Review of Literature

The literature review presents a summary of current research utilizing independent variables defined in this study to predict the likelihood of student dropout. Six studies examining contributing factors to university student dropout are discussed. Through careful analysis of the literature, common factors are identified and categorized to better understand the reasons behind students failing to complete their studies.

The Study by Sanders, Daly and Fitzgerald (2016)

The survey instrument utilized by Doyle, Hind, and Lopes (2013) identified multiple factors that contribute to the risk of failure for university students. One key factor is increasing diversity among the student population, which may create barriers to academic success for some students. Crosling, Thomas, and Heagney (2008) noted that students from disadvantaged backgrounds may encounter difficulties in adjusting to academic demands and university culture. Another critical factor identified by the authors is the early identification of students who may withdraw, which could be accomplished through early warning systems and proactive outreach to at-risk students (Tinto, 2012). Additionally, Baumeister and Vohs (2004) revealed that the development of a university-level academic skill set is a crucial factor that impacts students' achievement in higher education. This transition can be challenging for students who are not adequately prepared for the academic rigour of university courses. Additionally, changes in personal circumstances, such as family or financial issues, can negatively impact students' academic progress (Crosling et al., 2008). Finally, various key factors were identified that universities must address to improve students' retention and success rates, including social integration, support from peers and family, absenteeism, significant financial debt, self-esteem, and career prospects. For example, students who feel disconnected from the university

community may be more likely to drop out (Hurtado & Carter, 1997), and those who lack financial resources may struggle to meet basic needs and afford educational expenses (Goldrick-Rab, Broton, & Eisenberg, 2016).

The Study by Venuleo, Mossi and Salvatore (2016)

Guidi and Salvatore (2013) argued that a student's educational subculture plays a more critical role in determining university dropout rates than their prior academic knowledge and skills. While factors such as cognitive ability, personality traits, parenting style, and classmates' achievements may have some effect on predicting university success, they have minimal association compared to personal and social culture. The authors have identified several factors that can directly influence a student's educational success. These factors include the combination of a student's family, classmates, and university, which can affect their study commitment and learning engagement (Valadez, 2008). Additionally, the authors have identified the importance of the meanings that students use to interpret their role and context (Cole, 1996), the social environment and world they inhabit (Valsiner, 2000), and negotiated and shared meanings within subcultures (Guidi and Salvatore, 2013) in shaping educational outcomes. It could be concluded that personal and social culture have a more substantial influence on educational success than cognitive ability, personality traits, parenting style, or classmates' achievements (Valsiner, 2007).

The Study by Rodríguez-Gómez, Feixas, Gairín and Muñoz (2015)

Research has shown that student dropout is a major issue that educational institutions and policymakers must address to ensure that students have the support they need to succeed (Bean & Metzner, 1985; Tinto, 2006). The authors of a recent study have identified several factors that contribute to this problem (Smith & Shultz, 2020). For instance, enrolling in the wrong course due to a lack of proper guidance or information can lead to a student's disengagement,

dissatisfaction, and eventual dropout (Pascarella & Terenzini, 2005). Additionally, academic factors, such as a student's prior training and performance, can have a significant impact on their success in higher education (Schneider & Preckel, 2017). Failing to meet the requirements of the job market can also lead to students dropping out, as they may feel that their education is not preparing them for future employment (Lester & Keleher, 2016). Furthermore, the quality of teaching and the design and implementation of curricula play a vital role in student retention rates (Lizzio, Wilson, & Simons, 2002). If the teaching quality is poor or the curricula do not align with the needs and interests of the students, this can lead to a lack of engagement and interest in the course, resulting in student dropout. Financial factors, such as the cost of education and access to financial aid, can also influence student retention rates (Goldrick-Rab, 2016). Finally, the stature, trustworthiness, and financial stability of universities are also significant factors. If a university has a poor reputation, is not considered trustworthy, or is facing financial instability, this can lead to a lack of confidence among students and their families, which may contribute to student dropout rates (DesJardins, Ahlburg, & McCall, 2006). Overall, the authors' research has provided valuable insights into the various factors contributing to student dropout, highlighting the need for targeted and effective interventions to address this pressing issue.

The Study by Stinebrickner and Stinebrickner (2014)

The authors' research has provided valuable insights into the various reasons why students may leave the university before completing their studies. These reasons can be grouped into several categories, including demographic factors, academic performance, financial considerations, and personal reasons. In terms of demographics, the authors' research found that gender and race can have a significant impact on student dropout rates. Female students generally performed better than male students, which may contribute to lower dropout rates

among female students. Meanwhile, the dropout rate for black students was found to be the highest among all races, highlighting the need for targeted support and interventions to improve retention rates among this population. Understanding these demographic factors can help universities develop strategies to support students and improve retention rates.

Poor academic performance is a significant contributor to student dropout rates. A lack of academic success can lead to feelings of inadequacy, a lack of confidence, and a sense that staying in university is not worthwhile. Financial considerations also play a crucial role, with students from low-income families more likely to drop out of university due to financial strain (Goldrick-Rab, Broton, & Eisenberg, 2016). Additionally, a lack of parental support, especially for students who are the first in their families to attend university, can also contribute to a student's decision to leave university (Astin, 1993). Finally, personal reasons such as homesickness, mental health challenges, and dissatisfaction with the university experience can also lead to student dropout (Braxton, Hirschy, & McClendon, 2004). Overall, the authors' research has highlighted the complex and multifaceted nature of student dropout, emphasizing the need for targeted interventions that address the specific factors contributing to this issue. By understanding the reasons why students leave university, educational institutions and policymakers can develop strategies to support students and improve retention rates.

The Study by Chen (2011)

According to Chen (2011), the high university dropout rate cannot be attributed solely to the characteristics and behaviours of individual students, but also to institutional characteristics that can influence student behaviour. In his research, Chen cites several studies that identify various factors that contribute to student dropout rates. For example, Rhee (2008) emphasizes the importance of student demographics, while Kim (2007) focuses on the structural characteristics

of universities. Tinto and Pusser (2006) investigate the relationship between the characteristics of university teaching professionals and student dropout rates. Chen (2011) identifies two broad categories of factors that can influence student dropout rates: student characteristics and institutional characteristics. Student characteristics include factors such as demographics, socioeconomic background, student aspirations, academic achievement, financial assistance, and ability to integrate into campus life. Institutional characteristics include university structure, teaching resources, and financial resources.

By considering both student and institutional characteristics, educational institutions and policymakers can develop targeted interventions to improve student retention rates. By addressing the specific factors that contribute to student dropout, universities can improve the overall success and satisfaction of their students, ultimately contributing to a more successful and productive society. Overall, Chen's research highlights the need to move beyond a narrow focus on individual student characteristics and behaviours and to consider the broader institutional factors that contribute to student dropout rates. By adopting a more holistic approach, universities can better support their students and help them achieve their full potential.

The Study by Edwards, Cangemi and Kowalski (2001)

The authors found that students' commitment to an institution and their perceived value of education to personal development were significant factors in their decision to continue their education at a university. These findings were supported by Boyer (1987), who emphasized that students' intensity of commitment to an institution could reduce their likelihood of dropping out. The authors also examined academic factors such as insufficient study habits, unclear goals, and unsatisfied educational needs that can contribute to dropping out. In addition, they identified common personality traits among students who dropped out, including a lack of self-confidence,

self-sufficiency, and rebelliousness against authority (Churchill & Iwai, 1981). Financial, emotional, and environmental factors were also found to play a role in university dropout. For instance, family background, student expectations, and interactions with faculty were identified as environmental factors that can affect a student's decision to drop out (Tinto, 1975).

In conclusion, this research showed that multiple factors could contribute to university dropout. Therefore, addressing the university dropout rate requires a holistic approach that includes academic, environmental, emotional, and financial factors. Institutions can increase student retention by implementing policies that enhance student commitment, provide academic support, and create a supportive and inclusive campus environment. Additionally, students can benefit from setting clear goals, developing strong study habits, and seeking support from family, friends, and university resources.

Summary of Common Factors

Based on multiple research studies, there are some commonalities in the reasons for student dropout, although each author may have their distinct reasoning and justifications. Therefore, it is important to consolidate these perceptions into significant factors for further investigations and analyses. In this study, the author utilized their industrial experience and work exposure to regroup the factors, and identified eight common predictors, which are summarised in Table 1.

Table 1

Summary of Common Factors

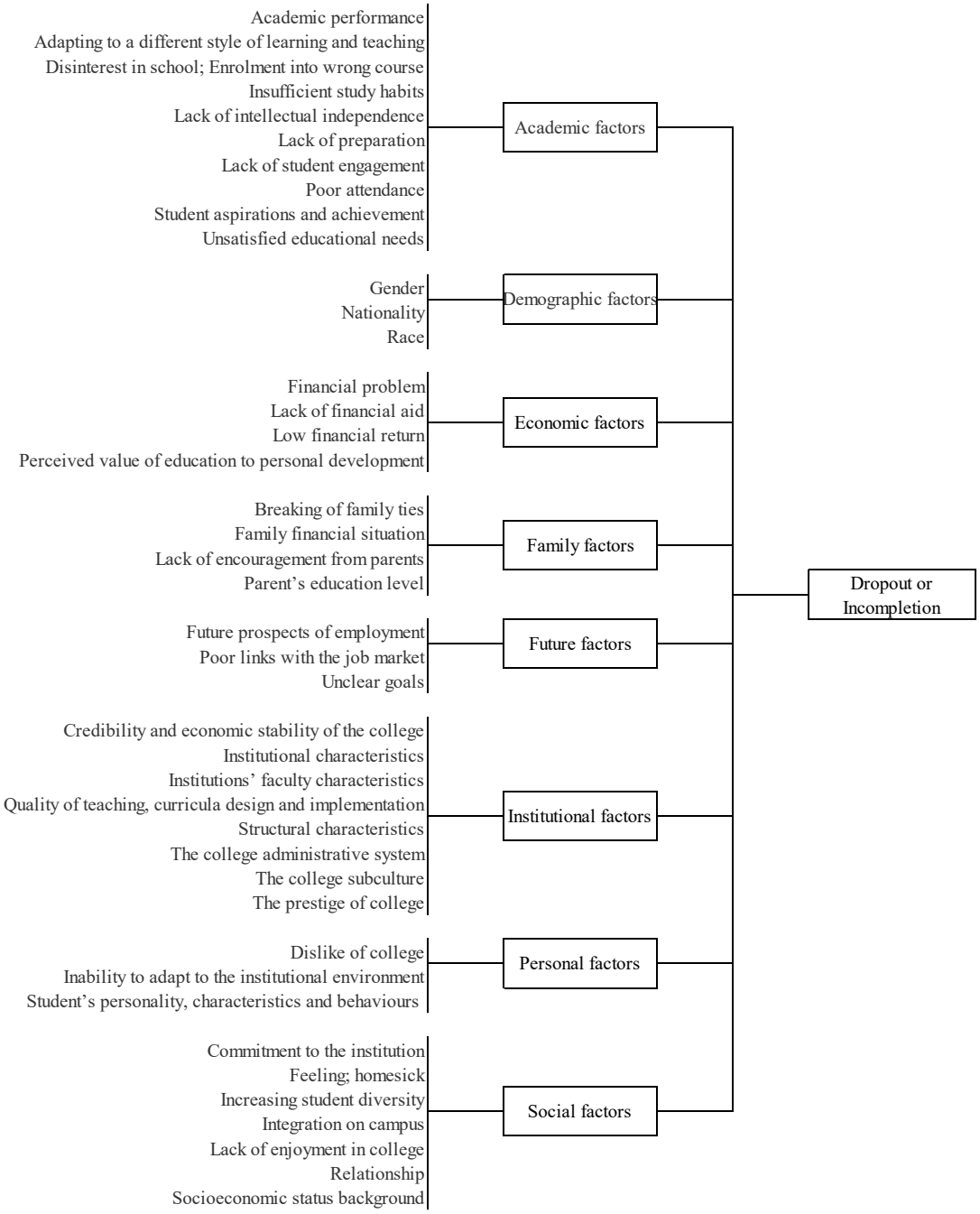
Independent Variable (Predictors)	Literature support
Academic factors • Academic performance; Adapting to a different style of learning and teaching; Disinterest in school; Enrollment into wrong course; Insufficient study habits; Lack of intellectual independence; Lack of preparation; Lack of student engagement; Poor attendance; Student aspirations and achievement; Unsatisfied educational needs	Sanders, Daly &Fitzgerald, 2016); Rodriguez-Gomez, et al., 2015; Edwards, Cangemi, & Kowalski, 2001.
Demographic factors • Gender; Nationality; Race	Stinebrickner & Stinebrickner, 2014; Rhee, 2008.
Economic factors • Financial problem; Lack of financial aid; Low financial return; Perceived value of education to personal development	Stinebrickner & Stinebrickner, 2014; Chen, 2011.
Family factors • Breaking of family ties; Family financial situation; Lack of encouragement from parents; Parent's education level	Sanders, Daly & Fitzgerald, 2016; Valsiner, 2007; Valadez, 2008; Stinebrickner, and Stinebrickner, 2014.
Future factors • Future prospects of employment; Poor links with the job market; Unclear goals	Sanders, Daly & Fitzgerald, 2016; Gomez, et al., 2015; Stinebrickner, and Stinebrickner, 2014; Edwards, Cangemi, & Kowalski, 2001.
Institutional factors • Credibility and economic stability of the college; Institutional characteristics; Institutions' faculty characteristics; Quality of teaching, curricula design and implementation; Structural characteristics; The college administrative system; The college subculture: The prestige of college	Sanders, Daly & Fitzgerald, 2016; Valadez, 2008; Guidi & Salvatore, 2013; Venufeo, Mossi & Salvatore, 2016; Gomez, et al., 2015; Chen, 2011; Kim, 2007; Gansemer-Topf & Schuh, 2006; Ryan, 2004; Titus, 2004; Tinto & Pusser, 2006; Schuster, 2003; Edwards, Cangemi, & Kowalski, 2001; Churchill & Iwai, 1981.
Personal factors • Dislike of college: Inability to adapt to the institutional environment; Student's personality, characteristics and behaviours	Sanders, Daly, & Fitzgerald, 2016; Valsiner, 2007; Cole, 1996; Venuleo, Mossi & Salvatore, 2016; Edwards, Cangemi, & Kowalski, 2001; Churchill & Iwai, 1981.
Social factors • Commitment to the institution; Feeling homesick; Increasing student diversity; Integration on campus; Lack of enjoyment in college; Relationship; Socioeconomic status background	Sanders, Daly, & Fitzgerald, 2016; Valsiner, 2007; Valadez, 2008; Cole, 1996; Valsiner, 2000; Venuleo, Mossi & Salvatore, 2016.

Johnson and Henderson (2012) stated that a theoretical framework is a structural tool used to link up theoretical assumptions and research application concepts to provide a general overview plan and outline the research's specific objectives. It serves as a guideline for the

research process where the research can be executed systematically in an appropriate manner. Hence, the Theoretical Framework of this study can be represented in Figure 1:

Figure 1

The Theoretical Framework



Research Questions

Based on the derived theoretical framework, the following research questions will be investigated in this study:

- What is the impact of academic, demographic, economic, family, future, institutional, personal, and social factors on the dropout rate in an engineering degree programme?
- Can these factors be integrated to develop a predictive model for the engineering degree programme's dropout rate?

Research Hypotheses

Based on the theoretical framework and research questions, the following hypotheses will be tested in this study:

- H_1: Academic factors will have a significant impact on the university engineering degree student dropout rate.
- H_2: Demographic factors will have a significant impact on the university engineering degree student dropout rate.
- H_3: Economic factors will have a significant impact on the university engineering degree student dropout rate.
- H_4: Family factors will have a significant impact on the university engineering degree student dropout rate.
- H_5: Future factors will have a significant impact on the university engineering degree student dropout rate.
- H_6: Institutional factors will have a significant impact on the university engineering degree student dropout rate.

- H_7: Personal factors will have a significant impact on the university engineering degree student dropout rate.
- H_8: Social factors will have a significant impact on the university engineering degree student dropout rate

Research Methodology

According to Bougie and Sekaran (2019), it is crucial to employ a systematic and organized research method and design to obtain relevant facts for critical analysis to address the research objectives. Debra and Rog (1997) and Mingers (2001) describe research design as a structured set of guidelines or a master plan that connects data collection and analysis activities, facilitating valid and reliable research results that can be used to address research questions. Therefore, this study utilized the research methodology proposed by Saunders et al. (2009), which employed a research process 'onion' consisting of five layers: philosophy, approaches, strategy, time horizons, and data collection methods.

Research Philosophy

To develop a suitable methodological framework, it is necessary to first identify the research philosophy, such as whether to adopt a positivist, interpretivist, or realist view (Bryman and Bell, 2007). Since university student dropout can be described, defined, verified, and predicted using quantitative data and statistical analysis, the philosophical framework of this study was based on positivism (Wisker, 2008). This means that the defined research hypotheses in this study were tested and validated using existing theories to develop a theory that addressed the research questions (Saunders et al., 2009). In other words, the study aimed to objectively examine the impact of various factors on university dropout rates at the university, utilizing

quantifiable properties, independent participants, and appropriate research instruments (Kasi, 2006).

Research Approach

When conducting research, either a deductive or inductive approach to reasoning could be adopted (Hussey & Hussey, 1997). The deductive approach is narrower in scope and commonly used to validate research hypotheses, while the inductive approach is more open-ended and exploratory (Robert & Richard, 2007; Wilson, 2010). In this study, the deductive approach was employed since various factors contributing to university student dropout will first be collected and evaluated, then refined into testable hypotheses to confirm or reject the initial assumptions.

Research Strategy

There were various research strategies available for researchers to choose from, such as qualitative strategies like grounded theory, ethnography, action research, and case study, or quantitative strategies like experiments and surveys, to address the research questions (Collins, 2010; Saunders et al., 2009). In this study, a survey research strategy was utilized because it allowed for the setting of research questions, the definition of theoretical hypotheses, the collection of quantitative data from a known population, and the analysis of data using both descriptive and inferential statistics. The study aimed to determine whether changes in the independent variables, or contributing factors, would affect the dependent variable, or student dropout rate. Ultimately, this was a correlational study intended to establish the relationships between the various factors and the student dropout phenomenon in the university and to develop a predictive model.

Time Horizon

It was necessary to consider the time horizon issue when planning this study. The choice must be made between using a longitudinal study which examines a phenomenon over a period of time, or a cross-sectional study which focuses on a specific moment in time. Additionally, in a cross-sectional study, data is collected at only one point in time, while a longitudinal study collects data at multiple points over a defined period (Sekaran & Bougie, 2010; Wilson, 2010). Due to constraints and limitations in resources and time, a cross-sectional study was used in this study since it measured the necessary variables in less time compared to a longitudinal study.

Data Collection Method

According to Somekh and Lewin (2005), survey questionnaires are useful for collecting data and conducting statistical analysis to verify research hypotheses. To ensure that the sample population adequately represented the entire university population, stratified random sampling was recommended based on the 16 departments/disciplines in the university, and the sampling frame obtained from the university admission department. The university's total population was about 8,000 students, so proportionate stratification was performed based on the respective department sub-populations. Using Krejcie and Morgan's (1970) random sampling chart and the National Statistical Service's (2017) online sampling size calculation, the sample size for this study was determined to be 367 students, with a 95% confidence level and a 5% confidence interval. However, since this was a fictional institution in a movie, the participants in this study were based on individuals who understood and/or experienced the education system in India. Consequently, a total of 101 respondents participated in this study through an e-survey.

According to various authors (Anderson & Morgan, 2008; Brace, 2008; Muijs, 2004; Pershing, 2006), the questionnaire should be simple and concise to ensure participant interest and

obtain accurate and unbiased data. Based on the identified contributing factors and university dropout from the literature review, constructs were included in the questionnaire and distributed over three months using a five-point Likert scale. Before the actual survey period, a pilot test was conducted to ensure construct validity. Participation was voluntary and anonymous, and randomly selected and respondents were assured that they would not be penalized for non-participation.

Data Analysis

This study aimed to prove research hypotheses on the contributing factors affecting university dropout rates using Confirmatory Factor Analysis (CFA) with Partial Least Square Regression (PLS) Path Model. The SmartPLS 4.0 programme was used as the analysis tool. The approach involved developing and analyzing a structural equation model (SEM) in two stages, as suggested by Chin and Marcoulides (1998). In the first stage, CFA will be conducted to measure the proposed model's multi-item constructs, including Construct Validity (consisting of Convergent Validity and Discriminant Validity) and Reliability. In the second stage, the proposed structural model will be analyzed for hypotheses testing. Additionally, Statistical Package for the Social Sciences (SPSS) Pearson Correlation and Multi-Linear Regression analysis were used to cross-examine and answer the proposed hypotheses. The respective coefficient of determination of the contributing factors was calculated to provide meaningful insights into their relationships with the university dropout rate.

Findings and Discussions

Confirmatory Factor Analysis

In this study, Confirmatory Factor Analysis (CFA) was performed to analyse the measurement model. According to Jeong (2012), the results will be derived from the analysis

using PLS Measurement Model based on the evaluation of Convergent Validity, Discriminant Validity, and Internal Consistency on the measuring items, and their suitability. Sekaran (2003) stated that to test the goodness of fit measures, the data collected should be tested and achieve both validity and reliability. Dane (2010), Fink (2009), and Kothari (2009) defined validity as the degree to which a test or study accurately reflects or assesses the specific theoretical concept that the researcher attempts to measure. Failure to achieve validity can result in inaccurate conclusions and interpretations. Shuttleworth (2009) explained that reliability is an indication of the stability and consistency with which the instrument measures the concept and hence confirms consistent measurement across time and various items in the instrument.

Construct Validity

It was verified by Jackson (2009), Lodico et al. (2010) and McBurney (2009) that the purpose of the construct validity is to measure the extent to which the items in a scale all measure nothing else but the same construct. Additionally, it was stated that it examines whether the instrument accurately measures a theoretical construct that it is designed to measure with reference to the theories or concepts behind the research.

Convergent Validity

Hair et al. (2010) show that convergent validity is the degree to which multiple items measuring the same concept agree. To verify this, factor loadings, composite reliability, and average variance extracted can be used to assess the convergence validity. Additionally, to achieve a level of validity, the loading for all items should exceed the recommended value of .500. However, the four outer loadings were below the requirements which could affect the convergent validity of the model; hence, one of the solutions was to remove them and re-tabulate the model. Consequently, Economic factor ECO04: ‘Perceived value of education to personal

development' (-.112), Family factor FAM01: 'Breaking of family ties' (.250), Institutional factor INST07: 'The college subculture' (.180), and INST08: 'The prestige of college' (.140) were removed and after re-running the matrix, all the loadings were below .500.

Composite reliability (CR) value depicts the degree to which the construct indicators indicate the latent. From Table 1, CR ranged from .780 to .985, which exceeded the recommended value of .700 as stated by Hair et al. (2010). Likewise, to justify the use of a construct, the average variance extracted (AVE) which measures the variance captured by the indicators relative to measurement error, should be greater than .500 (Barclay et al., 1995). Table 2 showed that the AVE of this construct ranged between 0.505 and .740. The results revealed that all 8 constructs: Academic (AC), Demographic (DEM), Economic (ECO), Family (FAM), Future (FUT), Institutional (INST), Personal (PER), and Social (SOC) are all valid measures of their respective constructs based on their parameter estimates and statistical significance.

Table 2

Result of the Measurement Model

Model Construct:	Items measured	Loading	T-value (p<.001)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Academic (AC)	10	.511 to .745	4.616 to 11.789	.870	.505
Demographic (DEM)	3	.818 to .864	16.460 to 23.462	.874	.698
Economic (ECO)	3	.822 to .855	17.800 to 23.188	.876	.703
Family (FAM)	3	.615 to .878	3.448 to 23.359	.780	.547
Future (FUT)	3	.762 to .909	6.879 to 47.384	.895	.740
Institutional (INST)	6	.647 to .904	5.135 to 17.735	.880	.555
Personal (PER)	3	.728 to .829	3.751 to 6.168	.830	.619
Social (SOC)	7	.586 to .785	5.603 to 11.988	.879	.511

Source: developed for this study

Discriminant Validity

According to Compeau et al. (1999), discriminant validity refers to the extent to which the items in a measure are able to differentiate among different constructs or concepts being

measured. It can be evaluated by analyzing the correlations between the measures of constructs that have the potential to overlap. In order to establish discriminant validity, it is expected that the items will have a stronger association with their own constructs in the model and that the variance shared between the construct and other constructs is, on average, lower. Adequate discriminant validity was attained in this study.

It was stated that the Heterotrait ratio measures the discriminant validity of a set of measures or a scale by comparing the correlation between different constructs to that between measures of the same construct. It is commonly used with other measures, such as the Fornell-Larcker criterion and average variance, to assess a scale's ability to differentiate among constructs. It was noted that a ratio below .400 indicates adequate discriminant validity, but it should not be the sole measure relied upon and should be interpreted in conjunction with other measures (Henseler et al., 2015). Accordingly, various constructs used in this study attained a ratio greater than .400 which implied inadequate discriminant validity (see Table 3).

Table 3

Discriminant Validity using Heterotrait Ratio

Model Construct	AC	DEM	ECO	FAM	FUT	INST	PER	SOC
Academic (AC)	.784*							
Demographic (DEM)	.904*	.720*						
Economic (ECO)	.351	.303	.216					
Family (FAM)	.228	.237	.139	.706*				
Future (FUT)	.235	.226	.187	.809*	.815*			
Institutional (INST)	.192	.098	.150	.206	.119	.157		
Personal (PER)	.756*	.693*	.642*	.652*	.578*	.564*	.390	
Social (SOC)	.232	.149	.168	.189	.143	.177	.731*	.537*

*>.400: inadequate discriminant validity

Additionally, according to PLS-SEM analysis, the Fornell-Larcker criterion (Fornell & Larcker, 1981). could also be utilized to establish discriminant validity. To determine discriminant validity, the AVE must first be calculated for each construct and compared with its

correlations with other constructs. If the square root of the AVE is found to be greater than the construct's correlations with other constructs, then discriminant validity is established. The Fornell-Larcker criterion simplifies this assessment process by presenting a summary table to evaluate whether each construct meets the criterion (see Table 3). According to some researchers, a common rule of thumb is to consider the square root of the AVE to be acceptable if it is greater than .500 or .700 (Kline, 2015). Table 4 showed numerous constructs failed to attain the suggested value which implied inadequate discriminant validity among constructs in this model. In particular, both PER and FAM constructs were removed to promote the validity and reliability of the findings.

Table 4

Discriminant Validity Using the Fornell-Larcker Criterion

Model Construct	AC	DEM	ECO	FAM	FUT	INST	PER	SOC
Academic (AC)	0.636							
Demographic (DEM)	0.642	0.836						
Economic (ECO)	0.733	0.580	0.838					
Family (FAM)	0.157*	0.166*	0.052*	0.740				
Future (FUT)	0.116*	0.222*	0.047*	0.491*	0.860			
Institutional (INST)	0.060*	0.161*	-0.072*	0.581	0.710	0.745		
Personal (PER)	0.039*	0.030*	0.091*	0.029*	0.011*	-0.095*	0.787	
Social (SOC)	0.700	0.622	0.572	0.528	0.549	0.533	0.325*	1.000

*<.500: inadequate discriminant validity

Reliability Analysis

Cronbach's Alpha Coefficient was used to assess the inter-item consistency or reliability of the variables used in this study. Table 5 summarised the loading and alpha values. Most alpha values were above .700, and composite reliability values ranged from .511 to .904. However, FAM and PER attained a value of .692 and .692 respectively which implied a moderate degree of internal consistency. They were somewhat related to one another, but there was still room for improvement. To enhance reliability, both FAM and PER were removed from this model. In

sum, internal consistency reliability was considered acceptable and the measurements were reliable.

Table 5

Results of Reliability Testing

Model Construct	Loading Range	Cronbach's Alpha	Number of items
Academic (AC)	.511 to .745	.835	10
Demographic (DEM)	.818 to .864	.786	3
Economic (ECO)	.822 to .855	.789	3
Family (FAM)	.615 to .878	.692*	3
Future (FUT)	.762 to .909	.828	3
Institutional (INST)	.647 to .904	.837	6
Personal (PER)	.728 to .829	.691*	3
Social (SOC)	.586 to .785	.838	7

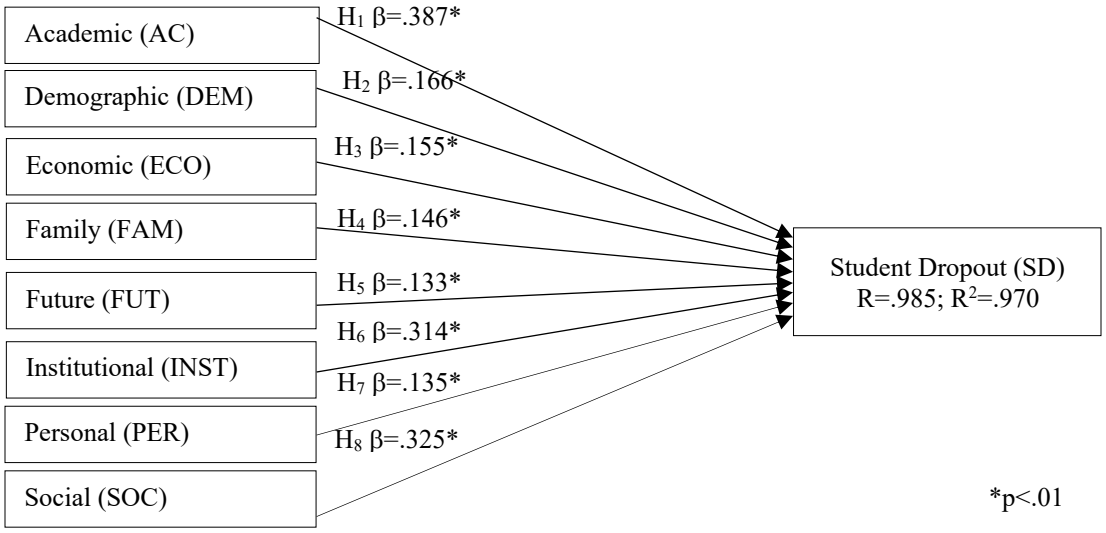
*<.700: moderate degree of internal consistency

Hypothesis Testing

SmartPLS used a procedure called Bootstrapping to generate T-statistics for significance testing of both the inner and outer models. The Bootstrap result approximates the normality of data. In this study, 5,000 subsamples were taken from the original sample with replacement to give Bootstrap standard errors, which in turn gives the approximate t-values for significance testing of the proposed structural path using the path weighting, or p coefficients and corresponding p values generated (Chin et al., 1998). Shin and Lee (2014) state that the structural model can be used to evaluate the variance explanation power (R^2) of structural concept, and the significance of path coefficient (β) expressing causal relationship information between two variables through structural equation analysis. The final SEM for this study is presented in Figure 2.

Figure 2

Measurement Model of the Study



According to Feyitimi, Nasieku, and Muturi (2016), the goal of PLS (Chin et al., 1998) is to obtain high R^2 values and significant t-values that can reject the null hypothesis. The study explains that absolute t-values greater than 1.65 indicate a significance level of .01, while values above 1.96 and 2.58 suggest significance levels of .05 and .01, respectively. Additionally, t-values above 3.26 indicate a significance level of .001 ($p < .001$). Relevant path coefficient values, β values, and significant p coefficients are presented in Table 6. The objective of the study was to examine the relationship between independent variables AC, DEN, ECO, FAM, FUT, INST, PER, SOC, and dependent variable SD. The study concluded that all null hypotheses were rejected, demonstrating that independent variables had a significant impact on SD. These findings are significant and warrant further investigation to better understand the relationships and influences involved.

Table 6

Summarized Results of the Hypotheses Verified

Hypothesis		Path Coefficient (β)	Sample Mean(M)	Standard Deviation (STDEV)	T Statistics	Decision
H_1	AC→SD	.387*	.383	.044	8.745	Adopted
H_2	DEM→SD	.166*	.164	.024	6.832	Adopted
H_3	ECO→SD	.155*	.152	.030	5.191	Adopted
H_4	FAM→SD	.146*	.141	.026	5.677	Adopted
H_5	FUT→SD	.133*	.134	.030	4.440	Adopted
H_6	INST→SD	.314*	.300	.037	8.469	Adopted
H_7	PER→SD	.135*	.125	.030	4.544	Adopted
H_8	SOC→SD	.325*	.322	.052	6.278	Adopted

Correlational Analysis

Figure 1 demonstrated a remarkably strong and positive correlation (r=.985, p<.001) between the dependent variable, Student Dropout (SD), and the independent variables: Academic (AC) .692, Demographic (DEM) .597, Economic (ECO) .532, Family (FAM) .424, Future (FUT) .524, Institutional (INST) .590, Personal (PER) .321, and Social (SOC) .490. The coefficient of determination (R2=.970) indicated that 97% of the overall change in student satisfaction can be explained by various student service activities, while the remaining 13% can be attributed to unidentified variables. It is noteworthy that FAM and PER exhibited the weakest correlation coefficients, whereas AC, DEM, and INST had the highest values, indicating their significant influence on the outcome of student dropout. Thus, the strongest correlation coefficients imply that the independent variables with the highest correlation coefficients (AC, DEM, and INST) have a more substantial influence on the outcome of student dropout than those with weaker correlation coefficients (FAM and PER). This finding could help prioritize resources and efforts towards improving the areas that have the most significant impact on student dropout (SD).

Multiple Linear Regression Analysis

This study utilized Multiple Linear Regression Analysis to explore the association between SD and AC, DEM, ECO, FUT, INST, and SOC, as illustrated in Table 7. Since FAM and PER did not meet the validity and reliability criteria, they were not included in the analysis. Following Kutner et al. (2004), this method allowed for the identification of the linear relationship between the dependent and independent variables, while also controlling for the effects of other independent variables. As noted by Field (2013), the main objectives of this analysis were to assess the unique contribution of each independent variable to the dependent variable, predict the value of the dependent variable based on the values of the independent variables, identify the most significant independent variable, and manage the effects of other independent variables.

Table 7

Multiple Linear Regression Analysis

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.215	.069		3.117	.002
	AC	.224	.015	.409	14.802	.000
	DEM	.067	.010	.159	6.790	.000
	ECO	.118	.016	.196	7.469	.000
	FUT	.091	.011	.204	8.438	.000
	INST	.235	.016	.372	15.059	.000
	SOC	.205	.012	.327	17.103	.000

[a.] Dependent Variable: SD

The F-test (6, 101) = 479.529, $p < .001$, demonstrated that the model was statistically significant. The model accounted for a large proportion of the variance in student dropout (SD) (96.6%). The results revealed that the independent variables, Academic factor (AC) ($\beta = .224$, $p < .001$), Institutional factor (INST) ($\beta = .235$, $p < .001$), and Social factor (SOC) ($\beta = .205$, $p <$

.001), had a significant positive impact on student dropout. However, the Demographic factor (DEM) ($\beta = .067$, $p < .001$) and Future factor (FUT) ($\beta = .091$, $p < .001$) had a less significant impact. Based on these findings, it is recommended that universities prioritize efforts to enhance academic, institutional, and social factors to reduce student dropout rates. Additionally, the predictive model developed from this study (Student Dropout (SD) = .215 + .224AC + .118ECO + .235INST + .205SOC) could be used to predict student dropout and develop strategies to improve student retention in these areas.

These findings suggest that interventions aimed at improving academic performance, student engagement, and addressing unsatisfied educational needs may be the most effective at reducing dropout rates. Other strategies may include providing targeted resources for students who struggle with adapting to a different style of learning and teaching or implementing attendance policies to encourage regular attendance.

Additionally, it was identified that several institutional factors had the potential to reduce student dropout, including the credibility and economic stability of the university, institutional and faculty characteristics, quality of teaching, curricula design and implementation, structural characteristics, the university administrative system, the university subculture, and the prestige of the university. To reduce student dropout, it was recommended that universities consider implementing strategies such as improving the quality of teaching and curricula design, addressing any structural or administrative issues that may hinder student success, and fostering a positive university subculture that promotes engagement and student well-being. Furthermore, universities could work to improve their reputation and prestige through various initiatives and partnerships, as this may increase student motivation and commitment to completing their

studies. Overall, the analysis suggested that addressing multiple academic factors could help reduce student dropout and improve student success in universities.

Lastly, to reduce student dropout rate, institutions can take measures such as providing academic support programs to improve academic performance, offering orientation programs to help students adapt to a different style of learning and teaching, and providing career counseling to ensure students are enrolled in the right course, creating a positive and engaging campus culture to foster student engagement and addressing social factors by promoting diversity, providing support for homesickness, and creating an inclusive environment for students of different socioeconomic backgrounds. It is also important for institutions to maintain a high level of credibility and economic stability, ensure high-quality teaching, design and implement effective curricula, have a well-structured administrative system, and foster a positive university subculture to increase institutional commitment and prestige.

Conclusion

The results of this study provide valuable insights into the factors that contribute to the high dropout rate among university students. The use of Confirmatory Factor Analysis (CFA) with the SmartPLS Measurement Model helped to ensure the validity and reliability of the measurement model, which consisted of eight contributing factors. Through Convergent Validity, Discriminant Validity, and Reliability Analysis, the model was rigorously tested, and the Pearson correlation and Coefficient of Determination were found to be significant. The findings of the study confirmed that the contributing factors have a direct and positive impact on the university dropout rate, and the null hypotheses were rejected accordingly. However, it was necessary to remove two factors (FAM and PER) from the model due to validity and reliability issues. Conversely, three factors (AC, INST, SOC) showed a stronger relationship with the

dropout rate, highlighting the importance of addressing these factors to maximize student retention. The results of this study can be used by university management to develop targeted interventions and countermeasures aimed at improving student retention rates. Furthermore, these findings provide a basis for future research into the factors influencing student retention in higher education, potentially leading to the development of more effective retention strategies and interventions.

Implications

This study's findings have significant and far-reaching implications. One such implication is that universities can use the insights gained to develop targeted interventions and strategies to improve student retention rates. Understanding the contributing factors that lead to student dropout enables universities to take steps to address these factors and support students more effectively, ultimately increasing their chances of completing their degree programmes.

Moreover, the study's identification of links between contributing factors and student dropout rates can help universities predict the likelihood of student dropout. This predictive model can be a valuable tool in universities' efforts to support students and improve retention rates. Additionally, the identification of links between various factors and reasons for university incompletion can offer useful guidance to other engineering universities facing similar challenges.

The conceptual framework established by this study can serve as a foundation for individuals interested in university policy and research. It can guide future research on the factors influencing student retention in higher education, potentially leading to the development of more effective retention strategies and interventions.

Overall, the study's findings have significant implications for university management, engineering universities, and individuals interested in university policy and research. The predictive model and conceptual framework developed in this study can be utilized to improve student retention rates and guide future research in this important area.

Limitations

Various limitations need to be considered when interpreting the results of this study. First, the study employed a cross-sectional design that may not fully capture the complexities and changes in the contributing factors over time. While a longitudinal study may provide a more in-depth understanding of the dynamics of student retention and dropout, it can be more time-consuming and expensive.

Second, this study relied solely on self-administered surveys, which may have limitations in terms of the participants' comprehension and response accuracy. Future research may benefit from incorporating qualitative interviews or focus groups to complement the quantitative data collected in this study.

It is also important to note that this study focused solely on engineering universities in India, limiting the generalizability of the findings to other types of universities or educational contexts. Therefore, caution should be exercised when applying the study's conclusions to different settings.

Despite these limitations, this study provides valuable insights into the critical factors that contribute to student dropout rate in engineering universities. The findings can inform the development of practical interventions and strategies to improve student retention rates. Future research can build on these findings by utilizing more comprehensive research methods and expanding the scope of the study to include other types of universities and educational contexts.

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