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# The Influence of Entrepreneurial Career Self-Efficacy on the Entrepreneurial Career Choice of Final-Year Engineering and Technology Students in Kenya

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## ABSTRACT

**Purpose:** This study examined the influence of entrepreneurial career self-efficacy on the entrepreneurial career choice of final-year engineering and technology students across three public universities in Kenya.

**Methodology:** Employing an explanatory sequential mixed-methods design, the research sampled 206 students through stratified simple random sampling from a target population of 1,620 final-year students enrolled during the 2020/21 academic year at Jomo Kenyatta University of Agriculture and Technology, Kenyatta University, and Moi University. Together, these institutions account for over half of public university enrolments in engineering and technology disciplines.

**Findings:** The findings revealed that entrepreneurial career self-efficacy significantly affects entrepreneurial career choice, while the moderating effect of entrepreneurial career interest was not statistically significant. Follow-up qualitative analysis indicated that heightened entrepreneurial self-efficacy is more often rooted in experience in the informal economy than in actual capabilities to establish Engineering and Technology Based New Firms (ETNFs). While initial employment aligned with students' fields of study remained a preferred path, participants acknowledged existing challenges related to employers' requirements and the job market.

**Unique Contribution to Theory, Practice and Policy:** The research contributes to the literature by adopting a career approach to entrepreneurship using a mixed-methods design focused on undergraduate engineering and technology students. It also underscores the importance of designing and implementing University Student Entrepreneurship Promotion (USEP) services that intentionally foster students' entrepreneurial self-efficacy for both entrepreneurship and employment paths. Future research should further explore the effects of USEP services on entrepreneurial career choice.

**Keywords:** *Career, Entrepreneurial Career Choice, Entrepreneurial Career Self-Efficacy, Entrepreneurial Career Interest*

**JEL Codes:** *L26, J24, I23*

## 1. INTRODUCTION

Student-led startups have grown worldwide, with many launched during university or soon after graduation (Wright, Mustar, & Siegel, 2020). Between January 2010 and July 2015, more than 970,000 student startups were recorded, though only 8% were venture-capital (VC) backed (PitchBook, 2016). In 2019, the world's top 100 universities produced 87,224 VC-backed startups, 44.9% of which involved undergraduates (PitchBook, 2019).

Globally, there is also a rising trend in students choosing entrepreneurship as a career path immediately after graduation. The Global University Entrepreneurial Spirit Students' Survey (GUESSS) reported rates of 8.8%, 9.0%, and 17.8% in 2016, 2018, and 2019, respectively (Sieger et al., 2021). The same 2021 survey was conducted in fifty-eight countries, and 79% of respondents were undergraduate students; the trend is also rising in Africa.

The policy commitments of key international and national education stakeholders, including UNESCO, have also emphasized graduate entrepreneurship and employability as key university education outcomes (UNESCO, 2016). When entrepreneurial careers involve engineering and technology students, the effects on employment creation and economic growth are even more pronounced (UNESCO, 2010; Biswas & John, 2022).

The global context for university students' entrepreneurial careers is also consistent with the Kenyan policy and institutional landscape. The country's well-established private sector, vibrant informal economy, and entrepreneurship culture provide a favourable context for the entrepreneurial career aspirations of university students. More importantly, Kenya Vision 2030 emphasizes Science, Technology, and Innovation (STI) as key drivers of the country's development roadmap, supported by relevant policy and legal frameworks. The notable growth of Kenya's ICT sector, ongoing digitalization, and the presence of one of the three largest technology hubs in Africa are also indicators of an enabling context (Moraa & Mui, n.d.; Ndemo, 2017).

As far as engineering and technology education is concerned, Kenya has made significant public investments, including the establishment of technical universities, which have resulted in a surge in undergraduate enrolment. Student engineering enrolment in public universities, which was 4,139 in 2012/13, had increased sixfold to 27,265 by 2017/18, whereas enrolment in private universities remained very low at 2.1% (Commission for University Education, 2018; Kashorda & Waema, 2015). In addition to building a skilled workforce, universities in Kenya also create supportive environments for academic and student entrepreneurship through research, innovation, industry collaboration, incubators, technology hubs, and industrial parks.

Engineering and Technology Based New Firms (ETNFs) operating in the formal economy, especially in manufacturing, agriculture, and ICT, are widely seen as important drivers of industrial transformation, job creation, and productivity growth. In Kenya, however, startups accounted for only 10 percent of the formal economy, about half the OECD average (World Bank, 2016b). The

2020 Kenya Economic Survey further reported that 90.7% of jobs created in 2019 were in the informal economy (Kenya National Bureau of Statistics, 2020).

The limited number of new firms in Kenya's formal economy is unsustainable because it constrains innovation, job creation, and the productivity benefits associated with ETNFs. A shortage of formal-sector startups may also channel entrepreneurial careers into the informal economy; an outcome Kenya seeks to avoid for its engineering and technology graduates. Although the informal sector contributes to employment and income, it is characterized by low productivity and limited innovation, among other challenges (World Bank, 2016a). It is therefore essential to increase the number of new firms in formal manufacturing and related sectors.

### *1.1. Statement of the Problem*

Although ETNFs, including undergraduate startups, are well positioned to contribute to employment creation and economic growth in Kenya's formal economy, important research gaps remain in understanding the human agency factors that shape students' entrepreneurial career choices. Addressing these gaps is necessary to inform policies and strategies that can increase undergraduate ETNFs during university study and after graduation.

In the literature, studies on student entrepreneurial intention (EI) and entrepreneurial career choice (ECC) have been grounded mainly in personality-trait theories, the Theory of Planned Behaviour (TPB), Social Cognitive Theory (SCT), and Social Cognitive Career Theory (SCCT). In Kenya, a Google Scholar search conducted on 3 October 2023 for the period 2018–2023 identified five relevant published journal articles on university students and alumni.

All five Kenyan studies used quantitative designs. Of these, one applied all three TPB constructs: attitude towards behaviour (ATB), subjective norms (SN), and perceived behavioural control (PBC) (Kosge et al., 2022). Two others combined TPB constructs with personality-trait variables, including self-efficacy (as a trait), proactiveness, risk propensity, and propensity to act (Mshenga et al., 2020; Ingabo, 2017). Environmental factors such as university support, social values, learning environment, and capital availability were also combined with TPB constructs (Ingabo, 2017; Becorace et al., 2020). Another study examined contextual variables alone as determinants of students' entrepreneurial activities in universities (Muithui et al., 2023).

Overall, Kenyan studies have advanced EI research by integrating TPB constructs with personality traits and contextual variables. However, important gaps remain in theoretical framing, variable selection, study design, and target population. Existing frameworks also provide limited explanation of the intention-action gap, despite increasing startup activity in universities. Because universities shape students' career interests and choices, a career-centred approach to entrepreneurship remains necessary.

Earlier Kenyan studies have not sufficiently examined entrepreneurial career self-efficacy (ECSE) and entrepreneurial career interest (ECI) as key determinants of ECC. They have also made limited

use of qualitative or mixed methods approaches, reducing their ability to capture issues that quantitative methods may overlook, especially among students transitioning to work. In addition, final-year engineering and technology students have received little attention as a target population. Against this background, this study examined the influence of ECSE on ECC and the interaction effect of ECI on the relationship between ECSE and ECC.

This study adopted a cross-sectional explanatory sequential mixed-methods design involving final-year engineering and technology students from three public universities in Kenya: Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenyatta University (KU), and Moi University (MU). Together, these universities accounted for more than half of public-university enrolment in engineering and technology in the country.

## 2. LITERATURE REVIEW

### *2.1 Theoretical Frameworks*

Theories used to explain students' entrepreneurial intention (EI) and entrepreneurial career choice (ECC) can be grouped into three broad categories: personality-trait, social-cognitive, and career theories. Personality traits are relatively stable patterns of thought, feeling, and behaviour that may be inherited or shaped by the environment (McDonald & Letzring, 2020).

Entrepreneurial personality traits (EPTs) refer to traits broadly linked to entrepreneurial outcomes across contexts (Howard & Boudreaux, 2021). Trait theories assume that specific EPTs, alone or combined, can predict entrepreneurial intention (EI) or behaviour, either directly or through proximal social-cognitive factors.

Among trait frameworks, the Big Five model is often used to explain EPTs (McDonald & Letzring, 2020). Another line of research groups key EPTs into a multidimensional construct including risk taking, achievement orientation, locus of control, self-efficacy, proactiveness, autonomy, and innovativeness (Howard & Boudreaux, 2021).

Despite their influence, trait theories are criticized for weak behavioural prediction across situations, limited motivational explanation, disagreement over common EPTs, overreliance on self-reports, and insufficient attention to context, culture, knowledge, and skills (Ajzen, 1991; Kerr et al., 2017).

The Theory of Planned Behaviour (TPB) is another major framework in student EI research. It treats intention as the immediate antecedent of behaviour and argues that attitude toward the behaviour (ATB), subjective norms (SN), and perceived behavioural control (PBC) are its main determinants. Other variables, such as education, gender, and prior experience, are assumed to act indirectly through these three constructs (Ajzen, 1991).

Although TPB has strengthened EI research by incorporating social-cognitive and motivational ideas, it is often criticised for reducing entrepreneurial behaviour to three predictors and for giving limited attention to contextual and emotional factors. It also does not explain the gap between

intention and action, a key issue in student entrepreneurship (Gelderen, 2015; Schlaegel & Koenig, 2014).

Social Cognitive Theory (SCT) explains behaviour through reciprocal interaction among personal factors, behaviour, and environment (Bandura, 1997). It emphasises human agency and commonly uses self-efficacy, outcome expectations, and goals to explain intention, behaviour, and career choice.

Within SCT, self-efficacy, belief in one's capability to perform required actions, is central and often the strongest predictor of intention or behaviour (Bandura, 1997). Its main sources are mastery experience, vicarious learning, social persuasion, and physiological or emotional states, and it is measured as domain-specific "can do" belief (Bandura, 2006).

SCT also highlights outcome expectations, beliefs about the consequences of action, and goals, which guide behaviour through motivation and self-regulation (Bandura, 2009; Lippke, 2020). Self-efficacy can shape both outcome expectations and goal-directed behaviour.

Social Cognitive Career Theory (SCCT) extends SCT to educational and career contexts through self-efficacy, outcome expectations, and goals (Lent et al., 1994). It is particularly useful here because it links self-efficacy to personality traits and abilities, and outcome expectations to value-related concepts found in other career theories.

The SCCT interest model explains career interest through self-efficacy and outcome expectations, while its career choice model adds contextual influences (Lent et al., 1994). In this study, ECC refers to choosing an entrepreneurial path and engaging in start-up preparation near career entry, such as graduation or the school-to-work transition.

SCCT defines career interest as patterns of likes, dislikes, and indifference toward career-related activities and occupations (Lent et al., 1994). This concept is useful for understanding academic and occupational development and for informing career guidance, exploration, and support services. From an SCCT perspective, career interest develops from self-efficacy and outcome expectations and changes through interactions among personal, behavioural, and environmental factors. SCCT also assumes a reciprocal link between goals and interests, reflecting the theory's dynamic nature (Lent et al., 1994).

Trait-based perspectives define career interest as relatively stable differences that shape preferences for work activities and environments. Holland's vocational interest theory is the best-known example, while other work suggests that interests are shaped by both genetics and environment and remain fairly stable, though not fixed (Van Iddekinge et al., 2011; Su et al., 2019).

Interest can also be viewed as a situational state triggered by environmental stimuli and marked by attention, engagement, and active processing (Durik, 2020). In educational psychology, repeated engagement can turn situational interest into individual interest through progressive phases of development (Hidi & Renninger, 2006). This view suggests that university

entrepreneurship promotion services may stimulate entrepreneurial interest and moderate career choice.

Overall, personality-trait theories and TPB have dominated student EI research, but both give limited attention to career development and context. Although PBC overlaps conceptually with self-efficacy, self-efficacy focuses more directly on perceived capability, and its antecedents can be assessed to inform targeted interventions (Newman et al., 2019). For these reasons, SCCT provides the principal framework for this study.

### *2.2 Empirical Frameworks*

Empirical research on student EI and ECC largely reflects the theoretical perspectives outlined above. Trait-based studies often use single or multiple entrepreneurial personality traits (EPTs) as predictors of EI. A recent systematic review found that, between 2012 and 2023, 59.2% of the independent variables used in student EI studies were EPTs (Xanthopoulou & Sahinidis, 2024). These traits are examined either as direct predictors or as antecedents mediated by TPB variables or self-efficacy.

A widely cited meta-analysis by Zhao et al. (2010) reported that all Big Five traits except agreeableness had small but significant positive effects on EI, with risk propensity showing the largest corrected effect size. The same study found that effects become stronger when traits operate through proximal social-cognitive variables.

TPB remains the most widely tested framework in student EI research. A review of 290 studies published between 2005 and 2022 found that, among the 36 most-cited articles, 19 used TPB alone and 17 combined it with other frameworks (Maheshwari et al., 2022). Meta-analytic evidence also shows strong empirical support for TPB, with standardized effects of ATB ($\beta = 0.33$), SN ($\beta = 0.14$), and PBC ($\beta = 0.35$), explaining 28% of the variance in EI (Schlaegel & Koenig, 2014).

Of the five Kenyan studies reviewed, three used TPB either alone or with personality and environmental variables. All focused-on entrepreneurship or business students, with samples of 171-400, and their findings generally align with the broader literature.

Even so, TPB explains intention better than action. A recent meta-analysis showed that EI accounts for only 17% of the variance in entrepreneurial behaviour, highlighting the importance of individual and contextual moderators in the intention-behaviour gap (Tsou et al., 2023).

By contrast, relatively few studies have applied SCCT to student ECC. Lanero and Vázquez (2016), studying 400 university students, found that entrepreneurial self-efficacy (ESE) had significant positive effects on ECC, career interest, and outcome expectations, and that their model explained 31% of the variance in ECC. However, career interest and intrinsic outcome expectations did not significantly predict ECC.

More broadly, SCCT studies on academic and occupational interests and choices consistently report strong path coefficients and model fit but often omit $f^2$ effect sizes for key predictors such as self-efficacy and outcome expectations (Lent & Brown, 2019). This limits practical interpretation of each predictor's unique contribution.

SCCT has also been used to address the intention-action gap. In a study of 1,698 master's students in Vietnam, ECC mediated the relationship between ESE and entrepreneurial career choice action, while perceived barriers weakened the ECC- action link moderated the indirect pathway from ESE to action (Duong, 2023).

Meta-analytic evidence shows that self-efficacy is a major predictor of academic and occupational career choice, and in entrepreneurship research it is commonly operationalized as ESE (Lent & Brown, 2019; Newman et al., 2019). ESE is context-specific and reflects belief in one's ability to perform entrepreneurial tasks. Because this study focuses on career-related entrepreneurial decisions, it uses the term entrepreneurial career self-efficacy (ECSE).

Across the studies reviewed by Newman et al. (2019), ESE functions as a predictor, mediator, or outcome. It is positively associated with ECC, EI, venture creation, and entrepreneurial performance, and is shaped by prior experience, entrepreneurship education, role models, mentors, and university support. Common measures include the scales developed by Chen et al. (1998) and DeNoble et al. (1999), which have also informed ECC research.

Research on career interest is extensive across theories and settings. In higher education, career interests shape academic and occupational choices and inform career support services (Ertl et al., 2023; Quinlan & Corbin, 2023). Within SCCT, self-efficacy and outcome expectations positively influence career interests, which in turn affect career choice (Lent & Brown, 2019).

Evidence on the stability of career interests is mixed. Some longitudinal studies suggest interests stabilize by the mid-twenties and remain fairly stable during university (Low et al., 2005; Ertl et al., 2023), while others report meaningful change over time, including during higher education (Hoff et al., 2018; Quinlan & Corbin, 2023).

Although situational interest and the four-phase model of interest development are mostly used in educational psychology, they may still help explain ECI development. University entrepreneurship promotion activities, such as competitions and networking events, may trigger situational interest and could therefore act as moderators.

SCCT rarely tests career interest as a moderator between self-efficacy and career choice. One exception is Patrick et al. (2011), who found that Holland's Realistic interest dimension positively moderated the relationship between self-efficacy and applied versus academic choices among Australian high school students.

Overall, four research gaps remain. First, student entrepreneurship is still underexamined from a career perspective despite growing startup activity in universities. Second, ECSE and

entrepreneurial career interest (ECI) remain underexplored in Kenya. Third, qualitative and mixed-methods approaches are rare, even though they can better capture the concerns of final-year students in transition. Fourth, engineering and technology students in Kenyan public universities remain understudied.

This study addresses these gaps by using SCCT to examine the direct effect of ECSE on ECC and the moderating role of ECI among final-year engineering and technology students in three public universities in Kenya, using a mixed-methods design.

### *2.3 Conceptual Framework of the Study*

Building on the preceding review of theories, variables, and empirical findings, this study proposes a conceptual framework to guide the analysis. The framework focuses on three main variables: entrepreneurial career self-efficacy (ECSE), entrepreneurial career choice (ECC), and entrepreneurial career interest (ECI). Figure 1 presents the proposed relationships among these variables.

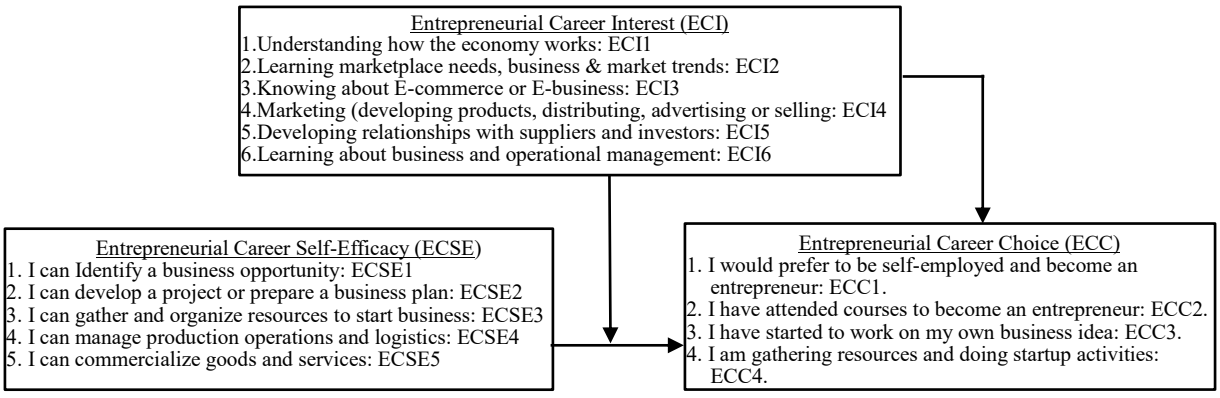


*Figure 1: Conceptual Framework of the Study*

Figure 1 further indicates that ECSE is expected to have a direct positive influence on ECC, consistent with earlier studies showing that ESE is a key determinant of ECC and behaviour (Lanero & Vázquez, 2016; Lent et al., 1994). The model also proposes that ECI moderates the relationship between ECSE and ECC. This assumption is informed by the role of career interest in career choice decisions (Stepanek & Paul, 2023), the limited empirical evidence on vocational interest as a moderator between self-efficacy and choice outcomes (Patrick et al., 2011), and methodological guidance that supports moderation analysis when theoretical and empirical uncertainty remains (Memona et al., 2019). Based on these proposed relationships, the study tests the following hypotheses:

$H_1$: ECSE has a positive and significant effect on ECC.

$H_2$: ECI has a positive and significant moderating effect in the relation between ECSE and ECC.

## 3. RESEARCH METHODOLOGY

The philosophical underpinnings of the study were grounded in the pragmatic perspective of mixed-methods design. Ontologically, this study blended realist and constructivist approaches with positivist and interpretivist epistemological stances. Accordingly, the study adopted an explanatory sequential mixed-methods design, in which quantitative data collection and analysis were followed by a qualitative phase to enrich and further explain the initial quantitative findings (Creswell & Clark, 2018).

### *3.1 Sampling*

The study's target population comprised 1,620 male and female final-year undergraduate engineering and technology students in the engineering and technology departments of JKUAT, MU, and KU. Based on the results of an engineering departments survey in Kenya, the three public universities accounted for 54.5% of student enrolments in the country during 2014/15 (Kashorda & Waema, 2015).

Sampling was operationalized using the following criteria: final-year engineering and technology students at JKUAT, KU, and MU during the 2020/21 academic year; full-time (regular) undergraduate students enrolled in the programmes; and both female and male students. The sampling frame was the electronic list of 1,620 final-year students.

The literature indicates that sampling for SEM analysis is not straightforward (Kline, 2016). Because SEM involves multivariate analysis, power-analysis concepts such as Type I error (α), Type II error (β), and effect size from similar previous studies are recommended (Cohen, 1992). Additional information included the number of latent variables and observed variables (indicators). For alpha and statistical power, 0.05 and 0.80 were selected based on common practice in the literature (Cohen, 1988). Regarding effect size, only one similar study on the ECC of university students, with an effect size of 0.31, was found and used (Lanero & Vázquez, 2016).

An online SEM sample-size calculator[3] calculated a minimum sample size of 139 needed to detect an effect. However, SEM scholars suggest a larger sample size of at least 200 (Kline, 2016). Therefore, the sample size was increased to 200. Stratified simple random sampling was applied, first by university enrolment share, then by academic programme or department, and finally by gender.

To ensure that at least 200 respondents would be available for data analysis, it was necessary to consider the potential effects of online survey response rates, the screening question, and data loss during collection and cleaning. Based on Dillman et al. (2014), who reported an average response rate of 25% for web surveys that can be improved through multiple follow-up methods, 80% was added to the initial sample size. As a result, 366 potential respondents were selected using Microsoft Excel random-number generation.

### *3.2 Measurements*

The selection of the variables and their measurements was based on the objectives of the study, as reflected in the conceptual model. Based on the operational definitions of the variables, the data collection instrument was pilot tested. An interval-type Likert scale measured each construct's indicators. ECC was measured by four indicators (Kolvereid, 1996; Souitaris et al., 2007) using a seven-point strongly disagree-strongly agree scale. ECSE was measured through nascent start-up behaviours expressed as "I can do" statements, using five indicators and a seven-point scale ranging from "I cannot do at all" to "I can do" (Kolvereid, 1996; Lanero & Vázquez, 2016). ECI was measured using six indicators of public-domain interest markers on a seven-point strongly dislike–strongly like scale (Liao et al., 2008).

### *3.3 Data collection*

Data collection began with email invitations sent to 366 potential respondents, of whom 274 completed the survey, resulting in an initial response rate of 74.8%. The dataset was subsequently cleaned for errors. Five cases were removed for incomplete responses, duplicate submissions, and participation by non-target populations. Because the data collection instrument required all necessary items for analysis, there were no missing data. The number of retained participants after applying the screening question was 221 (82.2%). A multivariate outlier assessment using the Mahalanobis distance test (Tabachnick & Fidell, 2019) excluded an additional fifteen cases. Thus, the final sample size available for data analysis was 206, with a realized response rate of 56.3%.

### *3.4 Data analysis*

Partial Least Squares Structural Equation Modelling (PLS-SEM) was selected because the technique accommodates non-normally distributed data (Hair et al., 2017). PLS-SEM is also recommended for entrepreneurship research (Manley et al., 2020). Accordingly, the cleaned dataset, which was free of missing values and multivariate outliers, was assessed for univariate and multivariate normality, linearity, and collinearity.

A univariate normality assessment was conducted using visual inspection of each indicator's histogram with a normal distribution plot, normal Q-Q plots, and boxplots. The dataset exhibited a pattern of consistent left skewness. The Shapiro-Wilk test (Shapiro & Wilk, 1965) for all indicators rejected the null hypothesis ($p > .05; N = 206$), indicating deviation from univariate normality.

Multivariate normality was assessed online[4] using Mardia's test and Henze-Zirkler's test (Mardia, 1971; Henze & Zirkler, 1990). Mardia's test indicated significant multivariate skewness, $(\chi^2(24) = 4002, p = 2.09)$, and the multivariate kurtosis was also significant $(z = 16, p < .001)$. Consistent with these findings, Henze-Zirkler's test also indicated deviation from multivariate normality $(HZ = 1.04, p < .001)$. To mitigate this problem, square root transformation of the data was applied because the data were negatively skewed (Field, 2018).

For the multivariate linearity assessment, scatterplots of each independent and dependent variable were visually inspected, and the data points approximated a straight-line pattern of linear relationship. Using a more robust second method, regression residuals were examined by plotting standardized residual values against standardized predicted values from multiple regression (Field, 2018). Accordingly, the residuals plotted against the independent variables showed scattered data points without forming patterns, indicating multivariate linearity.

The Variance Inflation Factor (VIF) was used to assess multicollinearity among the indicators and latent variables. Accordingly, the VIF values of the two exogenous variables, ECSE and ECI, were 1.231 and 1.243, respectively, and all 15 indicators were well below the threshold value of 5. Nevertheless, ECSE2 had a borderline VIF value of 3.053. Because there were no signs of multicollinearity among the exogenous variables, the marginal VIF value of one indicator did not indicate a multicollinearity problem (Hair et al., 2021).

In the first stage of the PLS-SEM analysis, the measurement model assessed the reliability and validity of the observed indicators and latent constructs. In the final stage, the structural model evaluated whether the sample data supported the study's conceptual model.

## 4. RESULTS AND DISCUSSION

### *4.1 Quantitative results*

Table 1 presents the demographic characteristics of the 206 respondents, including 29.6% female students and a mean age of 24.6 years (*SD* = 1.9).

**Table 1: Demographic Characteristics of the Sample (N = 206)**

| Sample characteristics | Frequency | % |
|---|---|---|
| University | 206 | |
| JKUAT | 106 | 51.4 |
| KU | 44 | 21.4 |
| MU | 56 | 27.2 |
| Gender | 206 | |
| Male | 145 | 70.4 |
| Female | 61 | 29.6 |

Note: Age M = 24.6 years old (*SD = 1.9*)

The first stage of the PLS-SEM analysis assessed the measurement model by examining the reliability and validity of the observed indicators and latent constructs, including internal consistency, convergent validity, and discriminant validity. Table 2 summarises these results.

**Table 2: Internal consistency and reliability of the indicators and latent variables (N=206)**

| Latent variables | Indicators | Outer loadings* | Average variance extracted (AVE) | Cronbach's alpha | Composite reliability ($rho_a$) | Composite reliability ($rho_c$) |
|---|---|---|---|---|---|---|
| ECC | ECC1 | .667 | .546 | .711 | .722 | .825 |
| | ECC2 | .589 | | | | |
| | ECC3 | .830 | | | | |
| | ECC4 | .838 | | | | |
| ECI | ECI1 | .654 | .581 | .857 | .907 | .891 |
| | ECI2 | .853 | | | | |
| | ECI3 | .627 | | | | |
| | ECI4 | .825 | | | | |
| | ECI5 | .807 | | | | |
| | ECI6 | .776 | | | | |
| ECSE | ECSE1 | .792 | 662 | .875 | .892 | .907 |
| | ECSE2 | .896 | | | | |
| | ECSE3 | .810 | | | | |
| | ECSE4 | .786 | | | | |
| | ECSE5 | .779 | | | | |

*All indicator loadings were significant ($p < .001$).

As shown in Table 2, most indicator loadings were significant ($p < .001$) and exceeded the recommended threshold of 0.708 (Hair et al., 2017). However, four indicators had loadings below 0.708 but above the minimum acceptable threshold of 0.400. These indicators were retained because their removal did not improve internal consistency or composite reliability, thereby preserving content validity (Hair et al., 2021). Convergent validity was assessed using Average Variance Extracted (AVE), and Table 2 shows that all constructs exceeded the 0.50 benchmark, confirming adequate convergent validity.

Internal consistency and reliability were assessed using three common measures: composite reliability $rho_c$ (Jorreskog, 1971), Cronbach's alpha (Cronbach, 1951), and composite reliability $rho_a$ (Henseler et al., 2014). As shown in Table 2, all three measures fell within the recommended range of .70 to .95, indicating satisfactory internal consistency and reliability. Discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) ratio. Following Henseler et al. (2014), all HTMT values were below 0.85, with the highest value observed between ECSE and ECC (.571), as shown in Table 3.

**Table 3: Discriminant Validity: Heterotrait-Monotrait Ratio (HTMT) (N = 206)**

| | ECC | ECI | ECSE |
|---|---|---|---|
| ECI | .385 | | |
| ECSE | .571 | .477 | |
| ECI x ECSE | .055 | .118 | .060 |

Having met all measurement model thresholds, the PLS-SEM structural model was used to assess the hypothesised relationships in the study's conceptual framework.

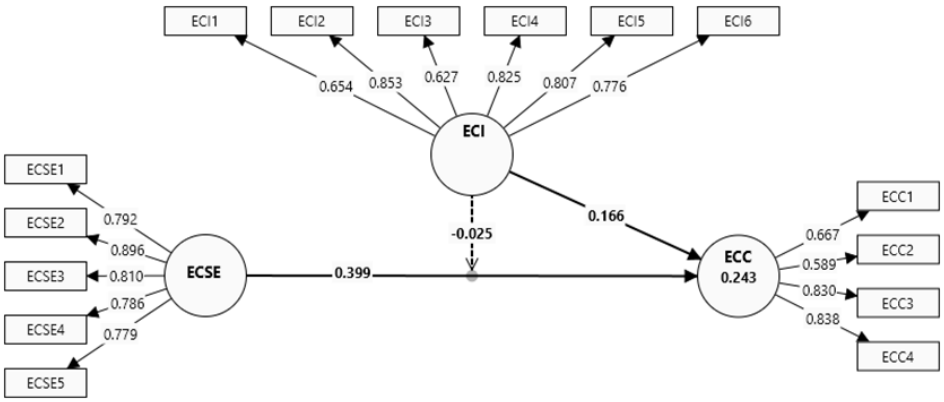


*Figure 2. PLS-SEM Path Model Estimation Results*

The analysis first presents the hypothesis-testing results, followed by the path coefficients, effect sizes ($f^2$), and the model's explanatory power ($R^2$). A PLS-SEM bootstrapping procedure with 10,000 subsamples and a .05 significance level was used to assess the significance of the path coefficients (Hair et al., 2021). As shown in Table 4, ECSE had a positive and significant effect on ECC (β = 0.399, t = 7.155, p < .001), supporting $H_1$. In contrast, ECI did not have a significant interaction effect on the relationship between ECSE and ECC (β = -0.025, t = .488, p = .313).

**Table 4: Hypothesis tests, path coefficients, confidence intervals, t-values, and p-values (N = 206)**

| Hypotheses | Relationships | β | 95% CI (LL,UL) | t | p | $f^2$ | Supports |
|---|---|---|---|---|---|---|---|
| $H_1$ | ECSE -> ECC | 0.399 | .309, .493 | 7.155 | .001 | .171 | Yes |
| $H_2$ | ECI x ECSE -> ECC | -0.025 | | .488 | .313 | - | No |

β = path coefficients, CI = confidence interval, LL = lower limit, UL = upper limit, t = T-statistics, p = p-values

The PLS-SEM path model analysis showed that ECSE had a significant positive effect on ECC ($\beta = 0.399$, 95% CI [.309, .493], $t = 7.155$, $p < .001$). Based on Cohen's (1988) guidelines, this path coefficient indicates a moderate effect. The effect size analysis further confirmed the practical relevance of ECSE, with a medium effect ($f^2 = 0.171$, $t = 3.089$, $p < .001$). In addition, the model explained 24.3% of the variance in ECC ($R^2 = 0.243$, $t = 5.267$, $p < .001$), indicating moderate explanatory power according to Cohen's (1988) benchmarks.

### *4.2 Discussion of the quantitative results*

This section interprets the quantitative findings and compares them with existing empirical literature. The path coefficient, effect size ($f^2$), and explanatory power observed in this study are consistent with previous research based on the same theoretical framework. The ECSE path coefficient reported here ($\beta = 0.399$, $p < .001$) closely resembles findings from earlier studies using the SCCT framework. For example, Lent and Brown (2019), in their meta-analytic review of students' STEM interests and career choice goals, reported a similarly strong self-efficacy-to-career-choice path ($\beta = .40$, $p < .001$). Likewise, Lanero and Vázquez (2016), in their study of ECC among university students, found a comparable self-efficacy path coefficient ($\beta = .420$, $p < .001$).

The medium effect size ($f^2 = 0.171$) observed for ECSE in this study remains important given the complex nature of entrepreneurial behaviour and career choice, which are shaped by multiple personal and environmental factors. This finding suggests that ECSE has a meaningful influence on students' entrepreneurial career choices and confirms its practical significance.

According to Cohen (1988), the model in this study demonstrates moderate explanatory power ($R^2 = 0.243$). However, based on Hair et al. (2017), this level of explanatory power may appear small, depending on the pattern of results in the relevant research domain and the number of independent variables. In a meta-analytic review of SCCT-based STEM career choice studies, Lent and Brown (2019) reported that direct and indirect effects of self-efficacy, outcome expectations, and career interest explained 45% of the variance ($R^2 = 0.45$, $p < .001$). Similarly, Lanero and Vázquez (2016) found that a study with four independent variables explained 31% of the variance ($R^2 = 0.31$, $p < .001$).

This study contributes to the literature by identifying a methodological gap in prior SCCT-based research: the underreporting of $f^2$ effect sizes for individual determinants. By calculating and reporting the $f^2$ effect size for the ECSE variable, this study addresses that gap and shows that ECSE has a significant effect on ECC. Future research should consistently report $f^2$ effect sizes to support meaningful comparisons and inform SCCT-based practical interventions.

The results showed that ECI did not have a significant interaction effect between ECSE and ECC. Variables not examined in this study, such as situational interest in USEP activities, may interact

more meaningfully with ECSE and ECC. Further research is needed to investigate the moderating effects of other variables, including the indirect effect of ECI.

### *4.3 Follow-up Qualitative Study Discussion*

In line with the explanatory sequential mixed-methods design of this study, the follow-up qualitative phase was conducted to gain deeper insight into key and unusual quantitative findings. Three quantitative results required further qualitative exploration. The first qualitative question focused on the ECSE finding, particularly its strong positive influence on ECC.

The second issue concerned the moderate to large $R^2$ effect size for ECC and what it implies for the quality of ECC decisions, particularly in the context of the limited number of engineering and technology-based startups in Kenya's formal economy. The third issue was the non-significant interaction effect of ECI in the relationship between ECSE and ECC.

The follow-up qualitative study used online focus groups, purposive sampling, and thematic data analysis. Four focus groups, each comprising 8–12 participants drawn from the quantitative phase across the three universities, were conducted. The thematic analysis yielded the following insights.

The qualitative findings explained the elevated self-efficacy observed in the quantitative phase by highlighting the sources of ESE. FGDs participants reported greater confidence in performing activities related to informal economy businesses than to formal engineering-based ventures. Key sources of self-efficacy included practical experience in personal or family businesses, role models, ease of entry, self-reliance, entrepreneurial culture, and supportive networks.

The qualitative findings on ECC, viewed in the context of the school-to-work transition, showed that participants' entrepreneurial career choices often involved businesses unrelated to their fields of study. They identified several barriers to starting engineering ventures, including limited skills and experience as fresh graduates, strict accreditation requirements, and high start-up costs.

The main motivations for choosing careers in the informal economy included the need to earn a living, the desire to achieve social status through self-employment, concerns about the availability of decent engineering jobs, and perceived barriers in the labour market. Overall, participants viewed necessity as the main driver of their ECC and saw business in the informal economy as a steppingstone to a more professional and rewarding long-term path. Their interest in starting such businesses was also influenced by the vibrancy of the informal economy and its low entry barriers.

FGD participants expressed a preference for engineering jobs in the formal economy over starting businesses in the informal sector, even though the latter was easier to pursue. They identified several barriers to securing engineering jobs, including limited availability, unreliable job information, high application costs, employer requirements that exceeded their skills, limited practical experience, and corruption in recruitment. Despite these challenges, they still preferred employment initially and considered entrepreneurship a later option after gaining experience.

The study found minimal interaction between ECI and ECSE in relation to career choice. FGD participants linked their interest in business to a strong entrepreneurial culture and to personal or family experiences that exposed them to business activities early in life, suggesting that interest in business was already high among participants.

### *4.4 Integration of Quantitative and Qualitative Results*

The quantitative findings indicate that the significant direct effect of ECSE on ECC reflects elevated perceived capability within the informal economy rather than within ETNFs in the formal economy, which require actual technical capability (competence).

Both the quantitative and qualitative findings indicated a preference for ECC. The qualitative explanations reflected participants' perceptions immediately after graduation, the types of entrepreneurial ventures they were likely to pursue, and the reasons for those choices. Graduates faced uncertainty and anxiety due to ETNF-related challenges and barriers in the job market, making both entrepreneurship and employment in their fields seem less promising. As a result, motivations for starting businesses in the informal economy were linked to confidence in managing informal businesses, the desire to earn an independent income, and the pursuit of socially acceptable status, including reduced reliance on family support.

These findings align with the global rise in ECC among university students. A recent multicountry survey found that students in African countries are four to five times more likely to pursue an entrepreneurial career immediately after graduation than students in developed countries (Sieger et al., 2024).

A notable divergence emerged between the quantitative and qualitative findings: participants who initially expressed a preference for entrepreneurial careers in the quantitative phase later shifted toward employment-oriented paths during the FGDs. They explained that their true preference was for jobs aligned with their academic qualifications and viewed initial employment as useful preparation for future entrepreneurial ventures. Although they recognised the challenges of securing such positions, they still regarded starting a business in the informal economy mainly as a livelihood contingency.

The qualitative finding that participants preferred decent-paying jobs aligned with their fields of study is consistent with a tracer study of Kenyan engineering graduates from 2009, 2014, and 2018. That study reported average outcomes of 71.2% employed, 8.6% self-employed, and 17.4% unemployed. It also highlighted a paradoxical labour market situation: a shortage of engineers alongside a mismatch between job seekers' skills and employers' requirements (University of Nairobi, 2021).

Both the quantitative and qualitative results indicated high level of ECI but with weak moderating role, in the relationship between ECSE and ECC, indicating its little variability to impact. The qualitative findings suggest that interest in specific entrepreneurial activities is already high and is

shaped by distal antecedents and develops through family experiences, entrepreneurial culture, and the dominant influence of the informal economy.

This study advances ECSE research by focusing on engineering and technology students at public universities in Kenya and highlighting the importance of these disciplines for technological progress and industrial transformation. The findings also support the applicability of SCCT in explaining the growing prevalence of student entrepreneurship in universities.

The strong influence of self-efficacy on career choice is consistent with previous research, reinforcing its importance as a key determinant of entrepreneurial behaviour. Self-efficacy also appears to support the development of actual capability, including the integrated knowledge, skills, and attitudes needed for enterprises in the informal economy, unlike ETNFs, which require higher levels of technical capability. For universities, this implies that efforts to strengthen students' ECSE should prioritise developing the underlying integrated knowledge, skills, and attitudes required for ETNFs.

Although most previous studies on university students' EI and ECC used quantitative approaches, this study's explanatory sequential mixed-methods design highlights the value of follow-up qualitative inquiry. It enables a deeper interpretation of the quantitative findings by situating them within Kenya's school-to-work transition, informal economy, and entrepreneurial culture.

A limitation of this study is the variability in undergraduate students' ECC decisions, a pattern frequently reported in previous research. Personal and environmental factors associated with the transition from education to work may affect the stability of ECC decisions and contribute to the gap between intended career choice and actual career action (Duong, 2023; Tsou et al., 2023).

A second limitation of this study is the absence of situational interest and interest development variables as proximal factors influencing ECC. Proximal sources of ECI stimulated by USEP activities may have a more direct effect than ECI shaped by both distal and proximal antecedents. As a result, ECI as an experiential state arising from USEP activities remains unexplored in relation to both its interaction effect on ECC and the development of individual ECI.

The relationship between situational interest in learning and the development of individual interest, as described in educational theories, may also be relevant to USEP activities, although research on this connection remains limited. Another limitation is the time gap between the quantitative and qualitative phases, which may have affected participants' ability to accurately recall their earlier responses during the FGDs. A concurrent mixed-methods design could help reduce this limitation.

Further research on the intention-to-behaviour gap between career choice and career action could clarify the factors that support or constrain start-up activity and help inform strategies to reduce this gap. More research is also needed on situational interest and interest development within the USEP framework, particularly how university-based USEP activities may foster individual ECI

and influence ECC. Future studies should also continue to use qualitative and mixed-methods approaches, including concurrent mixed-methods designs.

## 5. CONCLUSIONS

This study examined the effect of ECSE on the ECC of final-year engineering and technology students at three public universities in Kenya and assessed whether ECI moderates this relationship. Using an explanatory sequential mixed-methods design, the quantitative findings showed that ECSE exerts a strong positive influence on ECC. However, no moderating effect of ECI was found.

The qualitative phase reinforced the quantitative findings, added contextual insight, and revealed further complexity. It indicated heightened self-efficacy for starting and operating businesses in the informal economy. Yet, although self-efficacy is necessary, it is insufficient because it does not capture the underlying capabilities required for ETNFs.

A central implication is the need for interventions that build integrated knowledge, skills, and attitudes that can be translated into ETNFs. The qualitative ECI findings, together with insights from USEP services, also support the use of situational interest to foster individual ECI development and to evaluate the effects of existing USEP services, including their influence on students' ECC.

This research sought to advance ETNFs in Kenya's formal economy, particularly among undergraduate students. Student-led startups are expanding as universities increasingly integrate innovation and entrepreneurship into their teaching and research missions. However, evidence indicates that academic spin-offs and student startups in developed countries benefit from stronger institutional support and financing than those in emerging economies, which helps explain their faster growth and greater impact. In Kenya, meaningful expansion of undergraduate ETNFs will require stronger entrepreneurial competencies backed by institutional support, including finance.

This study recognises that student-led ETNFs face distinct challenges. Chief among them is achieving product or service excellence, which requires advanced technical expertise that may take time to develop. Students must also balance academic demands with the pressures of venture creation, often shaped by faculty expectations. The study therefore recommends prioritising initiatives that strengthen students' ESE through innovative curriculum design and comprehensive support services, without discouraging immediate startup engagement.

Equal attention is required to strengthen graduate employability. The findings show that addressing skills mismatch and persistent industry shortages demands urgent collaboration among universities, industry, and government. Effective strategies include mandatory academia-industry partnerships to identify in-demand skills, regular curriculum revision using outcome-based approaches, teaching methods that develop practical competencies, and professional development programmes to close graduate skill gaps.

Employability interventions must also respond to rapid technological change, including automation, Artificial Intelligence (AI), and the growing prevalence of gig work. Although gig work offers some opportunities, it may also undermine efforts to promote decent employment.

Closing the graduate competency gap in both entrepreneurship and employment requires urgent strategic action. Government has a central role in creating and sustaining an enabling framework through policy, regulation, and strategic investment. Delayed intervention may lead to skill atrophy, underemployment, financial distress, family dependence, and mental health challenges among graduates. It may also weaken the country's capacity to harness skilled human capital for innovation, industrial development, and infrastructure, while exacerbating brain drain, the expansion of the informal economy, and political and social instability.

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