

A Systematic Literature Review of University Student Enrolment From 2020 To 2023

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Abstract: This article undertakes a systematic literature review, employing the PRISMA method, to analyse university student enrolment from 2020 to 2023, a period significantly influenced by the COVID-19 pandemic. It is guided by key research questions: i) What theories or conceptual paradigms underpin the study?, ii) What variables intricately interface with the nuanced landscape of university student enrolment?, iii) Where is the designated research setting?, iv) What are the tools/approaches/models used for data analysis? and v) What are the main findings about student enrolment?. Employing a stringent PRISMA methodology, 17 articles were meticulously selected. These articles were subjected to qualitative appraisal based on predefined criteria, ensuring a focus on high-quality, relevant studies. The findings from these articles highlight significant themes: the rapid transition to online learning, the impact of socioeconomic factors on education access, trends towards internationalisation, the role of data analytics in enrollment management, the importance of the quality learning experience, and the influence of institutional branding on student recruitment. The findings suggest profound implications for higher education stakeholders. Firstly, the necessity for educational institutions to adapt to digital pedagogies is underscored. Secondly, addressing socioeconomic disparities in education access emerges as a critical concern. Thirdly, the increasing emphasis on global engagement strategies in university education is highlighted. Additionally, the role of data analytics in shaping recruitment and retention strategies is emphasised, along with the importance of comprehensive learning experiences and effective institutional branding. In conclusion, this review provides a nuanced understanding of the complex dynamics influencing university student enrolment during a period of global upheaval. It offers valuable insights for academic leaders, policymakers, and higher education administrators, stressing the need for adaptive, inclusive, and forward-looking approaches in higher education.

Keywords : Enrolment, Prisma, Student, Systematic Literature Review

1. Introduction

In 2019, the pervasive impact of the COVID-19 pandemic reverberated across global domains, with education bearing a particularly pronounced influence (Lee et al., 2022). Concomitantly, Thatcher et al. (2020) underscored the subsequent effect on student enrolment in universities. The pursuit of tertiary education, encompassing diploma, bachelor, master, or PhD degrees, assumes paramount importance for a nation's human capital development (Tan et al., 2023). Moreover, education stands as an indispensable catalyst for overall national development. In the post-COVID-19 era, spanning 2020 to 2023, there is an optimistic anticipation that student enrollment may witness improvement concomitant with the economic upturn (Wadud, 2023). However, a counter-narrative suggests a potential exacerbation of socio-economic disparities, particularly affecting impoverished families and impeding their ability to support their children's tertiary education pursuits.

Despite the provision of scholarships by universities, the scale of financial neediness among students, as highlighted by Williamson et al. (2020), poses challenges that these scholarships may inadequately address, consequently influencing student enrolment at a national level. Higher education institutions within every country are characterised by the coexistence of local or governmental and private universities. Governmental universities, as elucidated by La Velle et al. (2020), grapple with limited vacancies for each degree program. Nonetheless, their tuition fees remain affordable, rendering them accessible to a substantial portion of families. Notably, outstanding academic performance can pave the way for scholarship opportunities within these institutions. In contrast, private universities, reliant solely on investor contributions and tuition fees collected from students (Rana et al., 2022), become a viable alternative for those unable to secure admission into governmental universities. However, the prevailing financial crisis introduces a deterrent, potentially dissuading economically disadvantaged individuals from pursuing tertiary education within private institutions. Amidst these challenges, it is noteworthy that certain private universities proactively alleviate financial burdens by offering scholarships as both a means of support and a form of commendation for academic excellence.

This study is meticulously designed to scrutinise university student enrolment patterns spanning the period from 2020 to 2023. The research inquiries guiding this investigation are articulated as follows:

- i) What theories or conceptual paradigms underpin the study?
- ii) What variables intricately interface with the nuanced landscape of university student enrolment?
- iii) Where is the designated research setting?
- iv) What are the tools/approaches/models used for data analysis?
- v) What are the main findings about student enrolment?

2. Systematic Literature Review

A systematic literature review (henceforth, SLR) represents an exhaustive and methodically orchestrated approach to amalgamating extant research pertaining to a specific thematic domain (Singh & Thurman, 2019). It constitutes a rigorous methodology wherein the systematic exploration, critical evaluation, and succinct summarisation of the available literature are undertaken, thereby affording a comprehensive grasp of the prevailing knowledge landscape within a given field. The principal objective of an SLR is to discern, evaluate, and amalgamate all pertinent research evidence requisite for addressing a meticulously defined research question (Paul et al., 2021).

The initiation of a systematic literature review invariably commences with the formulation of a precisely delineated research question or objective (Singh & Thurman, 2019). This pivotal query serves as the lodestar guiding subsequent phases of the review and aids in articulating the inclusion and exclusion criteria that govern the selection of studies. The search strategy, a linchpin of the SLR, orchestrates a systematic and exhaustive exploration across diverse academic databases, journals, and allied sources, facilitating the comprehensive location of all germane studies (Paul et al., 2021).

A salient feature distinguishing an SLR from other variants of literature reviews resides in the meticulous and transparent methodology underpinning the study selection process (Paul et al., 2021). Every procedural facet, ranging from the initial identification of prospective studies to the ultimate inclusion of articles, is fastidiously documented and reported in a systematic fashion. This transparency not only fortifies the robustness of the review but also renders the entire process replicable, thereby permitting the validation of findings by other researchers (Raes et al., 2020).

Critical appraisal assumes a pivotal role within the domain of an SLR, involving the meticulous assessment of the quality and relevance of each selected study. This evaluative process encompasses scrutiny of research design, methodology, sample size, data analysis, and other salient factors, thereby gauging the reliability and validity of the studies under consideration. The critical appraisal framework significantly enhances the overall robustness of the review, ensuring that the resultant synthesis is informed exclusively by high-quality evidence (Raes et al., 2020)..

The culmination of an SLR manifests in the synthesis of findings from the selected studies. This entails the methodical organization, summarization, and analysis of data extracted from each study, facilitating the derivation of overarching conclusions and the identification of prevailing patterns or lacunae in the extant literature (Raes et al., 2020). The synthesis process may encompass diverse methodologies such as narrative summaries, thematic analyses, or, in certain instances, quantitative meta-analyses.

The paramount significance of a systematic literature review is encapsulated in its capacity to furnish a comprehensive and impartial overview of existing evidence. This serves to assist researchers, practitioners, and policymakers in making judiciously informed decisions. Through the harmonization of diverse perspectives and findings, an SLR contributes tangibly to the progression of knowledge within a specified field, concurrently elucidating avenues for prospective research (Singh & Thurman, 2019). Its methodological exactitude and transparency position it as an invaluable instrument for evidence-based practices and decision-making, resonating across the echelons of academia and beyond.

2.1 Review Protocol

A flowchart delineating the review protocol for this Systematic Literature Review (SLR) is presented herewith.

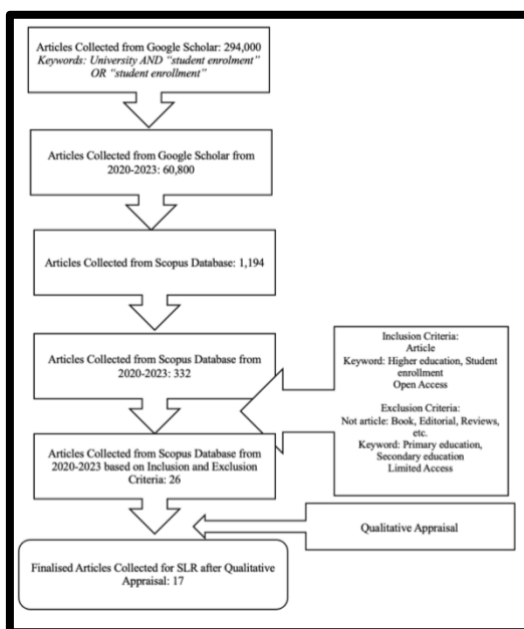


Fig. 1 Review Protocol

In this SLR, the initial phase of article retrieval involved the utilisation of specific keywords, namely [university AND “student enrolment” OR “student enrollment”]. This query was executed on Google Scholar, yielding an initial corpus of 294,000 academic publications. To manage the enormity of this dataset, a temporal constraint was applied, narrowing the publication range from 2020 to 2023. Subsequently, this refinement resulted in a more manageable subset of 60,800 academic publications. However, acknowledging the need for further refinement, a decision was made to exclusively collect articles from high-impact journals sourced from the Scopus database.

Upon replicating the same set of keywords within the Scopus database, a total of 1,194 publications were identified. By subsequently restricting the temporal scope to the years 2020 to 2023, the corpus was further refined, yielding a total of 332 relevant publications. The application of predefined inclusion and exclusion criteria, as delineated in the accompanying Table 1, facilitated the initial selection of 26 articles. This selection process served as the precursor to a subsequent qualitative appraisal.

The qualitative appraisal, explicated in Table 2, constituted the subsequent evaluative phase wherein the identified articles underwent meticulous scrutiny based on predefined criteria. This qualitative filtering process aimed to ensure the alignment of the chosen articles with the stipulated research objectives and methodological rigor. Following this discerning appraisal, a final selection comprising 17 research articles emerged as the chosen ensemble for inclusion in the SLR.

This structured and iterative process of keyword-based retrieval, database refinement, and rigorous appraisal not only streamlined the voluminous academic landscape but also fortified the final compilation of articles with a judicious selection of high-quality, pertinent studies for the ensuing SLR.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> ● Article ● Keywords: Higher education, Student enrollment ● Open Access 	<ul style="list-style-type: none"> ● Not article: Book, Editorial, Reviews, etc. ● Keywords: Primary education, Secondary education ● Limited Access

Table 2. Qualitative Appraisal

Qualitative Criteria	Remarks
It involves tertiary institution as the setting. Student enrolment is the dependent variable.	The study investigated tertiary institution. The dependent variable identified is student enrolment.
There are findings.	Findings are present.
There are research questions.	Research questions are found.
It is published in English language.	English is the medium.

3. Findings

Research Question i: What theories or conceptual paradigms underpin the study?

Presented herein is a tabular representation delineating the theories implicated in investigations pertaining to university enrolment. Furthermore, graphical depictions elucidating the conceptual paradigms inherent in the scrutinized studies are conspicuously featured.

Table 3. Theories Employed

Author(s)	Theories
Pantachang et al. (2022)	Theory of fuzzy time series (Zadeh, 1965)
Thomas and Allen (2021)	Reasoned action model (Fishbein & Ajzen, 2010) extended upon the theory of planned behaviour (Ajzen, 1985,1991) and theory of reasoned action (Fishbein & Ajzen, 1975)
Kehal et al. (2021)	Theory of racialised organisation (Ray, 2019; Wooten; 2006)
Eggers and Groothuis (2022)	Model of school choice (Jacob et al., 2018)
Cortes et al. (2023)	Model of student college choice (Chapman, 1981)

In the corpus of literature under review, five distinct studies are discerned, each anchored in specific theoretical foundations. The theoretical frameworks encompass the Theory of Fuzzy Time Series, as posited by Zadeh (1965) and expounded upon by Pantachang et al. (2022); the Reasoned Action Model, elucidated by Fishbein and Ajzen (2010) and applied by Thoman and Allen (2021); the Theory of Racialized Organization, drawing from the works of Ray (2019) and Wooten (2006) and empirically explored by Kehal et al. (2021); the Model of School Choice, as delineated by Jacob et al. (2018) and empirically scrutinised by Eggers and Groothuis (2022); and, lastly, the Model of Student College Choice, posited by Chapman (1981) and examined by Cortes et al. (2023).

Within this array of theoretical foundations, noteworthy parallels emerge, particularly among the Reasoned Action Model, the Model of School Choice, and the Model of Student College Choice. These theories converge in their shared capacity to prognosticate students’ decisions in selecting an educational institution for their studies. Conversely, the Theory of Racialized Organization stands apart, its uniqueness underscored by Kehal et al. (2021) investigation into unexpected enrollment patterns among diverse racial groups—Black, White, Indigenous, Asian and Pacific Islander, Latinx, and non-U.S. resident students—at selective U.S. institutions spanning the years 1990 to 2016.

Of particular intrigue is the Theory of Fuzzy Time Series, which distinguishes itself within this taxonomy of theories. Pantachang et al. (2022) endeavour to enhance the previously singular-valued neutrosophic hesitant fuzzy time series model. This augmentation involves the inclusion of varying degrees of hesitance, thereby augmenting forecasting accuracy in predicting the benchmark student enrollment dataset of a university. Evaluation metrics such as computation time, mean absolute percentage error, mean absolute error, and the root mean square error serve as benchmarks for assessing the efficacy of this refined model. Subsequent to this elucidation of the theoretical landscape, the ensuing discourse addresses the identified conceptual frameworks or models.

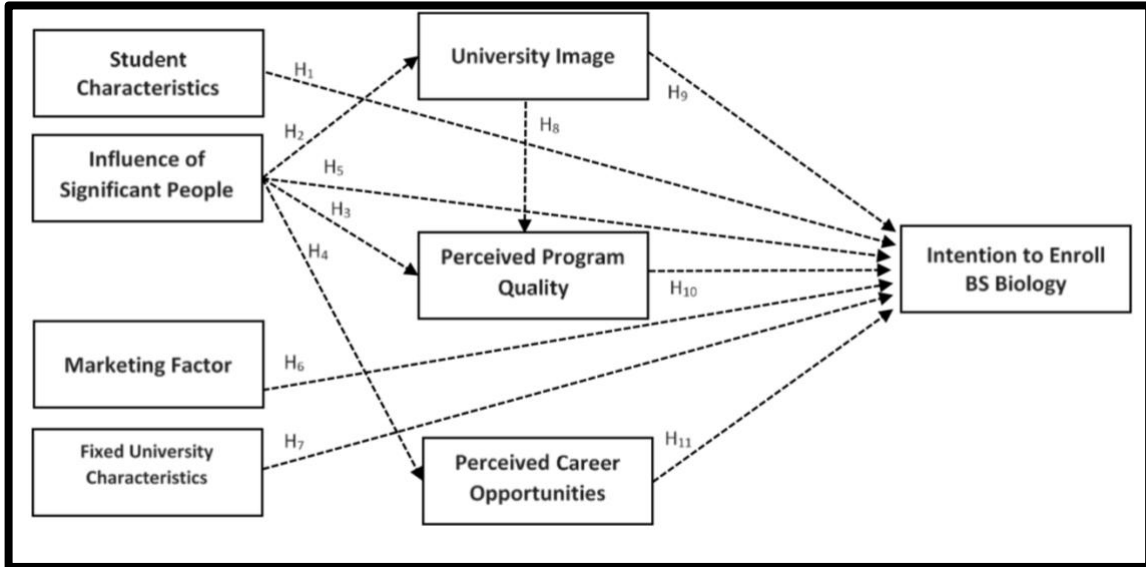


Fig. 2 Conceptual Model (Cortes et al., 2023)

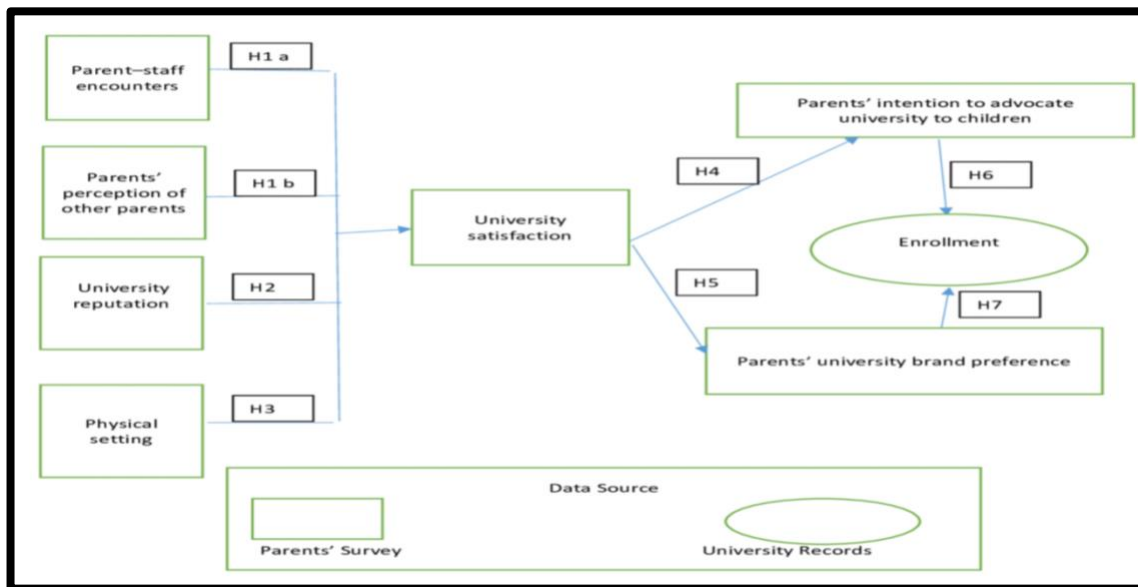


Fig. 3 Hypothesised Model (Eldegwy et al., 2022)

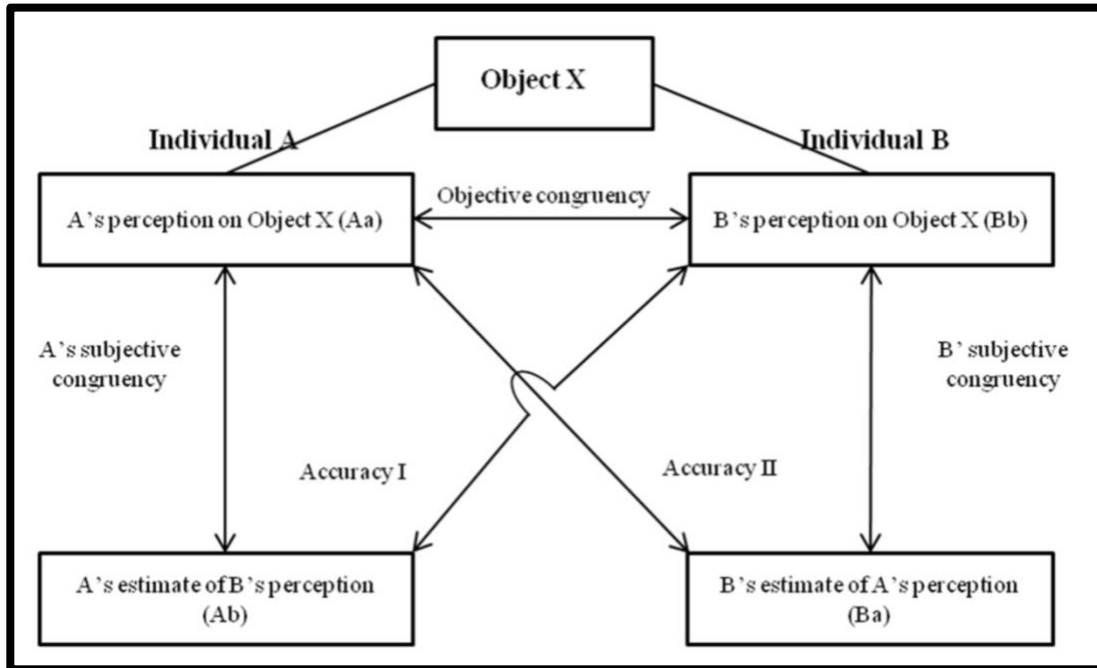


Fig. 4 Co-orientation Model (Oh & Shin, 2020)

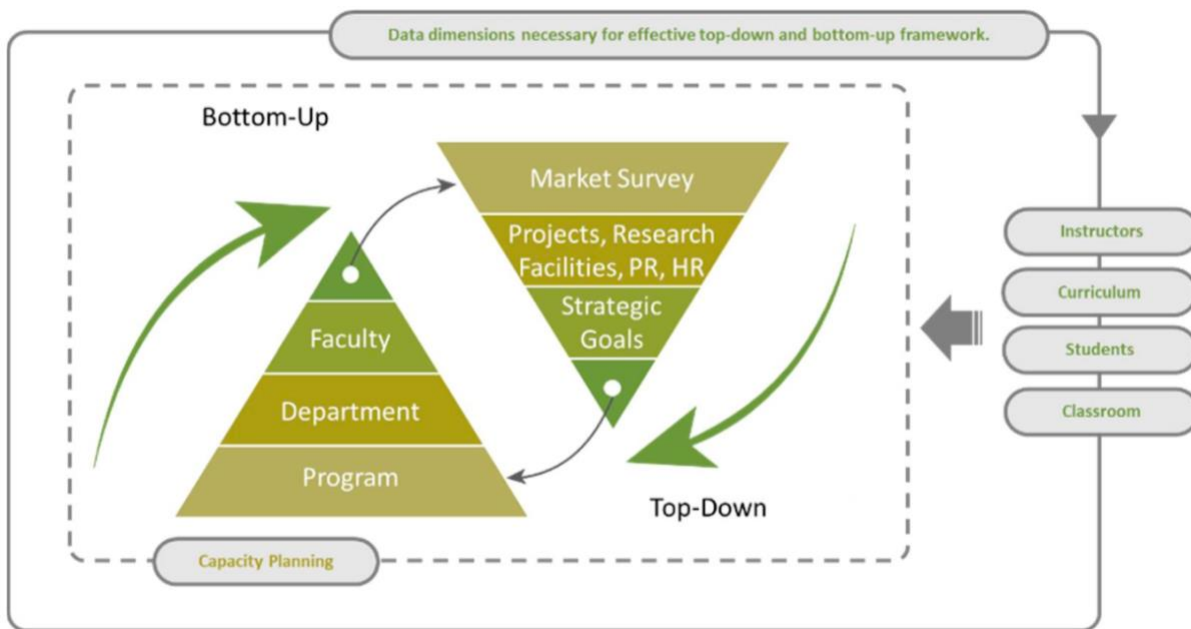


Fig. 5 Bottom-up and Top-down Framework of University Student Enrollment Capacity Planning (Makki et al., 2022)

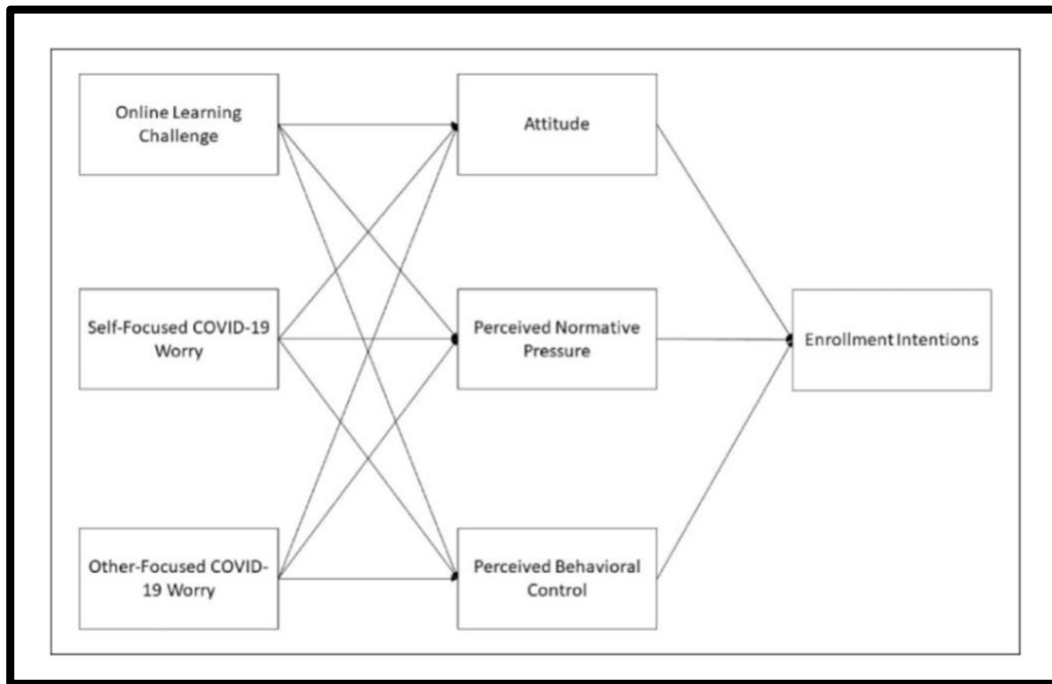


Fig. 6 Specified Path Model (Thomas & Allen, 2021)

In the corpus of 18 articles scrutinised, six present distinct models or conceptual frameworks pertinent to their respective studies. These frameworks delineate the relationships between independent and dependent variables. For instance, Figure 1, as explicated by Cortes et al. (2023), employs Chapman's (1981) Model to analyse the influence of various factors on the intention to enrol in an academic program. The constructs within this model include: (1) student characteristics, (2) the influence of significant people, (3) marketing factors, (4) fixed university characteristics, (5) university image, (6) perceived program quality, and (7) perceived career opportunities. These constructs were operationalised through an exhaustive literature review, forming the foundation for subsequent hypothesis testing in quantitative studies concerning university enrollment.

Eldegwy et al. (2022) in Figure 2, diverge slightly, focusing on the impact of parents on university enrollment decisions. Despite similar methodological approaches, the distinct emphasis on parental influence necessitates different constructs. These constructs are derived from Keaveney and Young (1997) and Navarro et al. (2005), which conceptualised student-teacher interactions within the physical confines of a university as determinants of student experience satisfaction. This model examines the relationship between satisfaction and subsequent behaviours toward the university. The current study builds on the hypothesis that consumer-parents, through direct experience with service attributes, can gauge the quality of their children's prospective education. Key predictors of satisfaction, as suggested by Parahoo et al. (2013), include university reputation and the nature of interactions between staff and students and among the students themselves. This study adopts three satisfaction drivers: human encounters, university reputation, and the physical setting, to investigate parental experiences during university visits.

Oh and Shin (2020) introduce an alternative co-orientation model. This model, originally developed by McLeod and Chaffee (1973), categorises perceptual congruence in the assessment of an objective X into three types: (1) objective congruence, (2) subjective congruence, and (3) accuracy. Objective congruence assesses the alignment between individual A's and B's perceptions of X. Subjective congruence is bifurcated into A's and B's subjective congruences, encompassing the congruence between individual perceptions and their estimates of the other's perception. Accuracy is similarly bifurcated, assessing the congruence between an individual's estimate of the other's perception and the other's actual perception.

Prevailing literature indicates that higher levels of congruence and accuracy facilitate effective bilateral communication (Ajieh & Uzokwe, 2014).

In an innovative approach, Makki et al. (2022) delineate a comprehensive framework for university enrollment capacity planning that adopts both bottom-up and top-down methodologies. This multifaceted framework advocates for initiating capacity deliberations at the granular level of individual programs. This initial step forms the foundational basis that aggregates to departmental capacities, aligning subsequently with the broader college and university capacities, as depicted in Figure 4. The framework emphasizes the creation of dynamic data repositories within departments to foster the development of data-driven decision support systems, thus facilitating evidence-based capacity planning. Such a model necessitates a transformative shift in the role dynamics between the deanship of admissions and registration and the respective departments. The deanship's role is reconceptualized from one of direct planning and student allocation to one that strategically supports and facilitates capacity planning, viewing the process through a top-down lens.

Distinctively, Thomas and Allen (2021) introduced a path model that incorporates the impact of COVID-19 on student enrollment intentions. Employing mediation analysis, they investigated whether the correlation between concerns about COVID-19 (both self and other-oriented), challenges encountered in online learning, and the intentions to enroll were influenced by intermediate variables such as learners' attitudes, perceived normative pressures, and perceived behavioral control. This sophisticated analysis utilized the JAMOVI statistical suite, specifically the advanced mediation models (jAMM) module (Gallucci, 2019). A visual interpretation of their mediation model is provided in Figure 5.

Research Question ii: What variables intricately interface with the nuanced landscape of university student enrolment?

In order to discern the multifaceted variables that interact with the nuanced landscape of university student enrollment, the table delineated below enumerates the identified variables.

Table 4. Variables Identified

Author(s)	Independent Variable	Dependent Variable(s)
Zakariya et al. (2022)	Teaching, feedback delivery and assessment in Mathematics 1	Students' perceptions opportunity for productive students' learning formative feedback students' time and effort
Eggers & Groothuis (2022)	Top party school	Student applications students' enrolment decisions
Cherian et al. (2020)	Entry grades	Students' enrolment Differences in part-time and full-time students between postgraduate and undergraduate study Student attrition Differences in the non-continuation in the year following entry among part-time and full-time first-degree entrants in different countries of the UK.
Wu et al. (2023)	Predictive model	Students' enrolment probability
Delucchi et al. (2021)	Growth of administrative	Faculty positions Student enrollments

Author(s)	Independent Variable	Dependent Variable(s)
Haley (2020)	Reproduction of geographically advantaged student groups	Students' enrolments Students' enrolments patterns
Kamssu & Kouam (2021)	COVID-19	University student enrolment decision Higher education resource allocation
Zeng et al. (2023)	Students' learning experiences	Challenges encountered in students' sustainable self-development Strategies adopted in students' sustainable self-development
Bhatt (2021)	Higher education system in India	Students' enrollment in social work courses
Thomas and Allen (2021)	COVID-related worry	University enrollment intentions
Makki et al. (2022)	Capacity planning decision support system-based framework	University student enrollment
Oh and Shin (2020)	Service trade strategies	Sustainability of the higher education enrolment system
Eldegwy et al. (2022)	Parents' impacts	University enrollment
Cortes et al. (2023)	Student characteristics influence of significant people marketing factor fixed university characteristics university image perceived program quality perceived career opportunities	Students' intention to enroll in a course
Pantachang et al. (2022)	Modified model of single-valued neutrosophic hesitant fuzzy time series	Daily closing prices of ten major cryptocurrencies benchmark student enrollment dataset
Kehal et al. (2021)	Affirmative action admissions policy	Student enrolment trends
Chen et al. (2020)	Online behavioural patterns for university departmental websites	Rate of enrollment

The systematic literature review, informed by the provided table, uncovers a diverse array of independent variables impacting various dependent variables, predominantly focusing on student enrollment in educational settings. The review demonstrates a significant emphasis on student enrollment; specifically, studies by Cherian et al. (2020), Wu et al. (2023), Delucchi et al. (2021), Haley (2020), Kamssu & Kouam (2021), Bhatt (2021), Thomas and Allen (2021), Makki et al. (2022), Oh and Shin (2020), Eldegwy et al. (2022), Cortes et al. (2023), and Kehal et al. (2021) explore this as a key dependent variable. Additionally, dependent variables such as students' perceptions, learning experiences, enrollment decisions, attrition, and enrollment probabilities are examined (Zakariya et al., 2022; Eggers & Groothuis, 2022).

The independent variables are categorisable into thematic groups: Educational Methods and Assessments (Zakariya et al., 2022), Institutional Characteristics (Eggers & Groothuis, 2022; Delucchi et al., 2021), Entry Requirements and Demographics (Cherian et al., 2020; Haley, 2020), External Factors (Kamssu & Kouam, 2021; Oh and Shin, 2020; Eldegwy et al., 2022), and Program and Marketing Attributes (Cortes et al., 2023). Notably, the impact of COVID-19 on student enrollment decisions (Kamssu & Kouam, 2021; Thomas and Allen, 2021) and the role of marketing and university image (Cortes et al., 2023) in

influencing student decisions are emerging trends. There is also an emerging interest in how external and socio-economic factors affect enrollment, such as the studies on parents' impacts (Eldegwy et al., 2022) and service trade strategies (Oh and Shin, 2020).

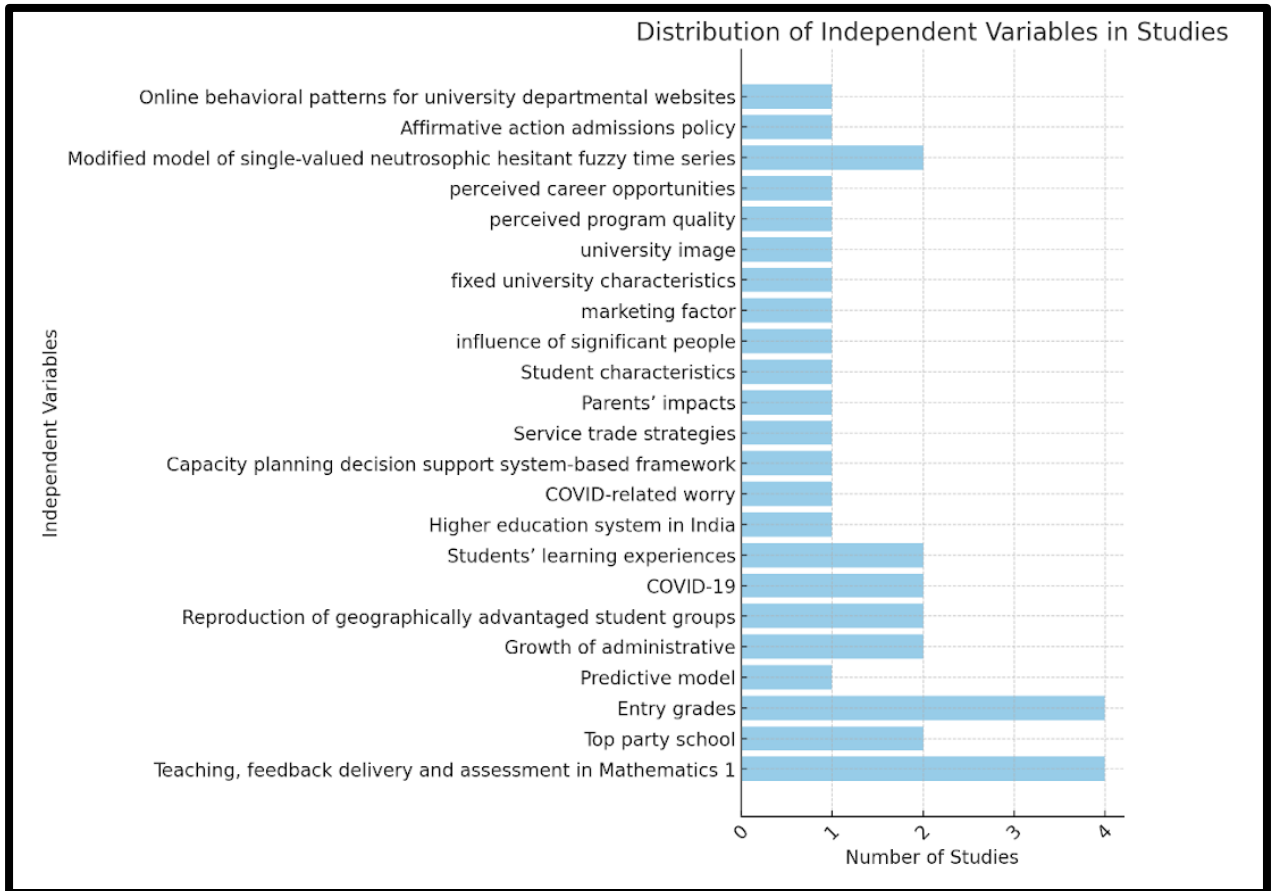


Fig.7 Distribution of Independent Variables in Studies

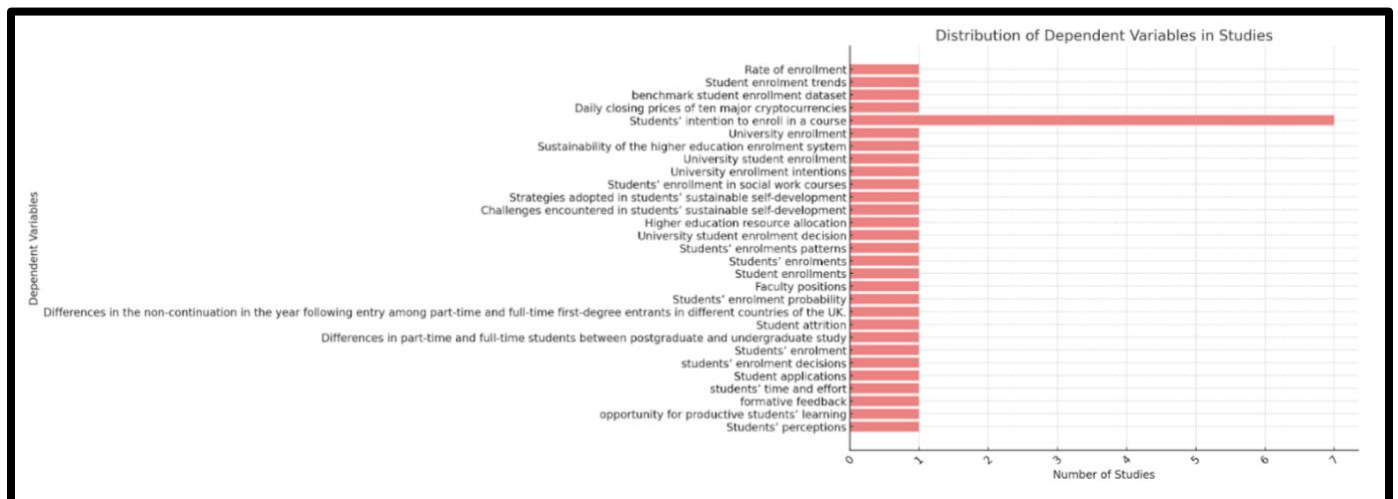


Fig. 8 Distribution of Dependent Variables in Studies

The analysis of the bar charts depicting independent and dependent variables from the systematic literature review provides essential insights into the educational research landscape, particularly concerning student enrollment and its influencing factors.

The bar chart reflecting independent variables demonstrates a wide range of factors impacting educational outcomes. This diversity, encompassing variables such as 'COVID-19' (Kamssu & Kouam, 2021; Thomas and Allen, 2021) and 'Entry grades' (Cherian et al., 2020), signifies a comprehensive approach adopted by researchers to grasp the complex nature of educational settings and student decision-making. The prominence of themes like the repercussions of global crises and the significance of entry qualifications in education underscores prevailing concerns in the field. However, the analysis also uncovers research gaps. Lesser-explored areas like 'Service trade strategies' (Oh and Shin, 2020) and 'Parents' impacts' (Eldegwy et al., 2022) suggest opportunities for future investigations to enrich the literature.

The concentration on student enrolment is evident in the significant number of studies focusing on this aspect (Cherian et al., 2020; Wu et al., 2023; Delucchi et al., 2021; Haley, 2020; Kamssu & Kouam, 2021; Bhatt, 2021; Makki et al., 2022; Oh and Shin, 2020; Eldegwy et al., 2022; Cortes et al., 2023; Kehal et al., 2021). This emphasis highlights enrolment as a pivotal educational outcome. Moreover, the presence of variables like 'Students' perceptions' and 'Learning experiences' (Zakariya et al., 2022; Eggers & Groothuis, 2022) in the analysis indicates a broader inclination towards understanding qualitative aspects of education, crucial for holistic educational development.

These bar charts provide a critical and analytical overview of prevailing trends in educational research. They underscore the significance of both quantitative measures, like enrolment rates, and qualitative aspects, such as student perceptions and experiences, for a comprehensive understanding of educational success. The analysis not only reflects the current research focus but also highlights areas where further scholarly work is essential to address gaps and broaden our comprehension of the educational domain.

Research question iii: Where is the designated research setting?

To delineate the specified research setting, the ensuing discussion is augmented by the inclusion of a tabular representation and a corresponding graphical depiction. This approach facilitates a comprehensive understanding of the research environment under investigation.

Table 5. Research Setting

Author(s)	Research Setting
Chen et al. (2020)	Taiwan
Kehal et al. (2021)	United States
Pantachang et al. (2022)	Alabama
Cortes et al. (2023)	Philippines
Eldegwy et al. (2022)	Egypt
Oh and Shin (2020)	South Korea
Makki et al. (2022)	Saudi Arabia
Thomas and Allen (2021)	United States
Bhatt (2021)	India
Zeng et al. (2023)	China
Kamssu & Kouam (2021)	United States
Haley (2020)	Sweden
Delucchi et al. (2021)	United States
Wu et al. (2023)	Taiwan
Cherian et al. (2020)	United Kingdom
Eggers and Groothuis (2022)	United States
Zakariya et al. (2022)	Norwegian

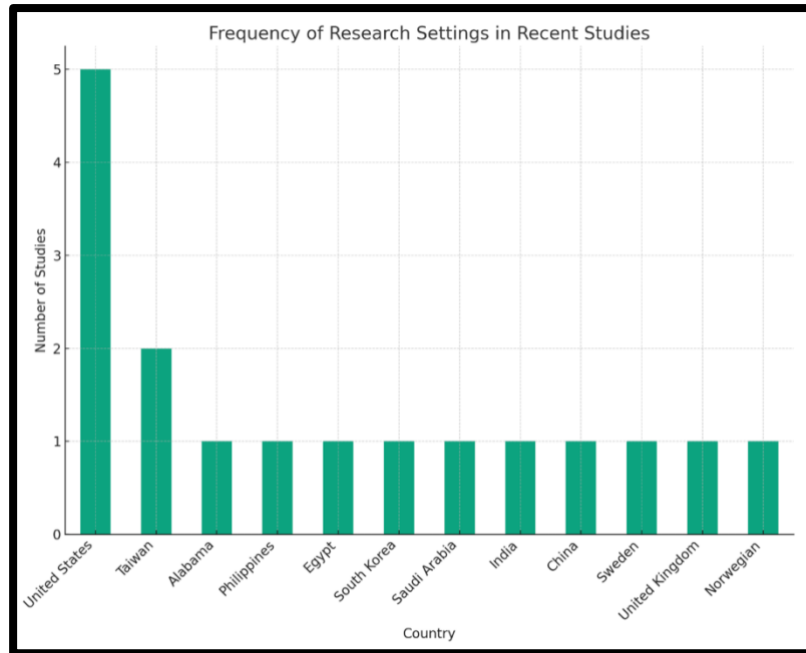


Fig. 9 Frequency of Research Settings in Recent Studies

The dataset under examination delineates a geographically expansive array of empirical studies, with the United States prominently featuring as the predominant locus of these scholarly pursuits. This trend is exemplified through the works of various academicians, including Kehal et al. (2021), Thomas and Allen (2021), Kamssu and Kouam (2021), Delucchi et al. (2021), and Eggers and Groothuis (2022), who have all elected the United States as their investigative milieu. The recurrent selection of the United States as a site for research may be ascribed to its demographic heterogeneity and its prominent stature on the global stage, thereby rendering it an ideal backdrop for diverse academic explorations.

In parallel, the academic corpus is witnessing a growing emphasis on Asian perspectives, as evidenced by studies conducted in Taiwan (Chen et al., 2020; Wu et al., 2023) and South Korea (Oh and Shin, 2020). This shift highlights a burgeoning interest in Asian contexts within scholarly discourse. Additionally, the inclusion of research from the Middle East, with Makki et al. (2022) in Saudi Arabia, and African contexts, exemplified by Eldegwy et al. (2022) in Egypt, signifies a broadening of the research spectrum beyond traditional Euro-American centric viewpoints.

The precise identification of Alabama as a research site by Pantachang et al. (2022) merits particular attention. It indicates an inclination towards examining regional attributes, potentially yielding insights that diverge from those obtained in more general national-level analyses.

The heterogeneity in research locations is pivotal for fostering a holistic understanding that encompasses a vast range of socio-cultural environments. This diversity not only augments the scholarly discourse but also ensures that academic investigations retain their relevance in an increasingly interconnected and globalized milieu. This visual and analytical depiction of research settings offers a vital snapshot of the contemporary academic landscape, underscoring prevalent trends and identifying prospective avenues for future scholarly inquiry.

Research question iv: What are the tools/approaches/models used for data analysis?

A table and a chart are provided herein to facilitate the resolution of the posed research question.

Table 6. Data Analysis Tool/Approach/Model

Author(s)	Data Analysis Tool/Approach/Model
Chen et al. (2020)	Google Analytics
Kehal et al. (2021)	Fixed effects modelling
Pantachang et al. (2022)	Single-valued neutrosophic hesitant fuzzy weighted geometric
Cortes et al. (2023)	Structural equation modelling
Eldegwy et al. (2022)	Structural equation modelling
Oh and Shin (2020)	t-test: SPSS and AMOS
Makki et al. (2022)	General algebraic modelling system; top-down and bottom-up approach
Thomas and Allen (2021)	Mediation analysis
Bhatt (2021)	Document analyses
Zeng et al. (2023)	Interpretative phenomenological analysis
Kamssu & Kouam (2021)	Document analyses
Haley (2020)	Multinomial logistic regression
Delucchi et al. (2021)	Distribution; Pearson's correlation coefficients; variance inflation factors; logistic model
Wu et al. (2023)	Logistic regression model
Cherian et al. (2020)	Higher education statistics Agency performance indicators
Eggers and Groothuis (2022)	Descriptive statistics
Zakariya et al. (2022)	Basic descriptive statistics; Thematic analysis

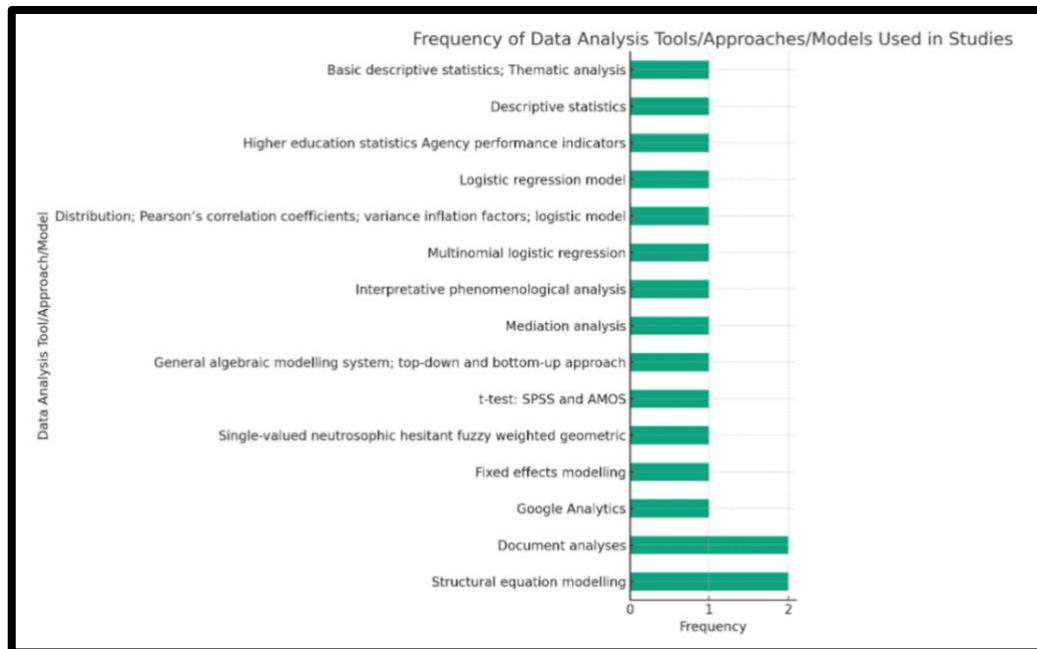


Fig. 10 Frequency of Data Analysis Tools/Approaches/Models Used in Studies

The horizontal bar graph meticulously delineates the frequency of utilisation of diverse data analysis tools, methodologies, and models in 14 studies reviewed, as reported by an array of authors. This graphic representation serves to underscore the eclectic methodological preferences emblematic of the inherently multidisciplinary nature of contemporary scholarly inquiry.

Analysing the frequency distribution, one observes a pronounced predilection for specific tools/approaches such as 'Structural Equation Modelling', 'Document Analyses', and 'Descriptive Statistics', each utilised recurrently across the study. For instance, 'Structural Equation Modelling' finds application in the works of Cortes et al. (2023) and Eldegwy et al. (2022), suggesting a shared analytical framework potentially attributable to the intrinsic characteristics of the data sets or the specific research questions posited in these studies. Similarly, the deployment of 'Document Analyses' by Bhatt (2021) and Kamssu and Kouam (2021) indicates a commonality in methodological approach.

Notably, the preponderance of tools cited singularly in the study reflects the bespoke nature of research methodologies, tailored to meet the unique exigencies of individual investigative endeavors. The employment of 'Single-Valued Neutrosophic Hesitant Fuzzy Weighted Geometric' by Pantachang et al. (2022) and 'Interpretative Phenomenological Analysis' by Zeng et al. (2023) exemplify such specialised analytical strategies, perhaps indicative of the complexity and nuanced nature of the data sets or an emphasis on interpretative depth in these particular studies.

The chart thus elegantly encapsulates the diversity in data analysis approaches, highlighting the imperative of methodological pluralism in academic research. This diversity not only reflects the multiplicity of analytical perspectives applicable to data interpretation but also underscores the importance of methodological selection in shaping the epistemological and ontological foundations of research.

Regarding the temporal distribution of these methodologies from 2020 to 2023, there appears to be no discernible trend indicating a paradigm shift or evolutionary progression in methodological preferences. This observation could be interpreted as indicative of a state of equilibrium in methodological choices within this dataset's scope, suggesting either the enduring efficacy of established methods or, conversely, potential avenues for innovation in analytical approaches to yield novel insights. In conclusion, the chart offers a concise yet profound insight into the methodological landscape of contemporary academic research, revealing the intricate and multifaceted nature of current research practices. This overview not only illuminates the complexity inherent in research methodology but also serves as an impetus for continued exploration and innovation in research.

Research question v: What are the main findings about student enrolment?

This academic session is dedicated to the presentation and critical analysis of the salient findings derived from a comprehensive review of 17 scholarly studies. The objective is to synthesise the primary outcomes and insights gleaned from these diverse research endeavours, thereby contributing to a more profound and integrated understanding of the specific academic field under examination.

The focus will be on elucidating the key discoveries and thematic resonances that emerge from this collection of studies, offering a consolidated view of the prevailing scholarly discourse. This synthesis aims not only to highlight individual study findings but also to discern patterns, commonalities, and potential areas for further scholarly exploration within the aggregated body of research. The session serves as a nexus for academic dialogue, fostering a deeper comprehension of the intricate tapestry of knowledge that these studies collectively weave.

Table 7. Main Findings about Student Enrolment

Author(s)	Main Finding(s)
Chen et al. (2020)	Homepage and subject credits, course planning, teacher lineup, and certificate of subjects should be enhanced to improve students' enrolment.
Kehal et al. (2021)	Stated policy usage was associated with increased Black student enrolments. However, at less selective institutions, policy usage was associated with decreased Black student enrolment and increased non-U.S. resident enrolment.
Pantachang et al. (2022)	Single-value neutrosophic hesitant fuzzy time series model outperforms other fuzzy time series methods in predicting the benchmark student enrollment dataset in terms of computation time, the mean absolute percentage error, mean absolute error and the root mean square error.
Cortes et al. (2023)	Student characteristics influence students' intention to enrol on the academic degree program.
Eldegwy et al. (2022)	Parent university satisfaction (human encounters, university reputation, physical setting) was found to driven intention to advocate to student and brand preference. These affect enrolment.
Oh and Shin (2020)	Service trade strategy is an efficient wat to operate study abroad programs for universities in order to help them maintain both the current institutional framework and sustainability.
Makki et al. (2022)	Capacity planning decision support system-based framework effectively affects student enrolment capacity planning on strategic and operational levels.
Thomas and Allen (2021)	Behavioural intention was found to share a positive relationship with enrollment behaviour.
Bhatt (2021)	Changes in the socio-political environment, human relationships and social space, technology, globalisation processes and global agenda affect the students enrolment.
Zeng et al. (2023)	Learning atmosphere, number and quality of teachers, learning spaces, campus and urban environment, and university and community culture affect students' sustainability and subsequently impact their enrollment.
Kamssu & Kouam (2021)	COVID-19 leads to decrease of students' enrollment. Universities are installing more IT facilities and promote more IT related courses for students in post-COVID world.
Haley (2020)	Over time metropolitan students from less advantaged backgrounds have increasingly attended university colleges, particularly those whose qualifications excluded them from entering the more prestigious universities.

Author(s)	Main Finding(s)
Delucchi et al. (2021)	It was found that additional workload of academic and non-academic staffs have no direct relationship to the addition of student enrollment.
Wu et al. (2023)	Predictive model outputs a probability that students will enrol and thus helps admission committees more effectively select students.
Cherian et al. (2020)	There exists a clear association between entry grades and student retention for part-time students, which may aid policy makers, academics, university staff, and higher education stakeholders to develop appropriate strategies to address attrition levels.
Eggers and Groothuis (2022)	The publicity of being named the top party school enhances a school's undesired reputation, thereby influencing student enrollment decisions, particularly among top-tier students.
Zakariya et al. (2022)	Due to high student enrolment, The teaching is dominated by teacher-led instruction, note-taking, and large pieces of proof which make learning difficult for students during class activities. The results also show that the current structure of the course offers limited formative feedback to students and that the assessment tasks require restructuring to capture students' time and effort.

Authors	Main Findings	Theme
Chen et al. (2020)	Homepage and subject credits, course planning, teacher lineup, and certificate of subjects should be enhanced to improve students' enrolment.	Institutional Offerings
Kehal et al. (2021)	Stated policy usage was associated with increased Black student enrolments. However, at less selective institutions, policy usage was associated with decreased Black student enrolment and increased non-U.S. resident en	Policy and Demographics
Pantachang et al. (2022)	Single-value neutrosophic hesitant fuzzy time series model outperforms other fuzzy time series methods in predicting the benchmark student enrollment dataset in terms of computation time, the mean absolute percentage e	Data Analysis and Predictive Models
Cortes et al. (2023)	Student characteristics influence students' intention to enrol on the academic degree program.	Student Characteristics
Eldewgy et al. (2022)	Parent university satisfaction (human encounters, university reputation, physical setting) was found to driven intention to advocate to student and brand preference. These affect enrolment.	Parental and Brand Influence
Oh and Shin (2020)	Service trade strategy is an efficient way to operate study abroad programs for universities in order to help them maintain both the current institutional framework and sustainability.	Global Strategy and Sustainability
Makki et al. (2022)	Capacity planning decision support system-based framework effectively affects student enrolment capacity planning on strategic and operational levels.	Strategic Planning and Capacity
Thomas and Allen (2021)	Behavioural intention was found to share a positive relationship with enrolment behaviour.	Behavior and Enrolment
Bhatt (2021)	Changes in the socio-political environment, human relationships and social space, technology, globalisation processes and global agenda affect the students enrolment.	Socio-political and Global Impact
Zeng et al. (2023)	Learning atmosphere, number and quality of teachers, learning spaces, campus and urban environment, and university and community culture affect students' sustainability and subsequently impact their enrolment.	Learning Environment and Culture
Kamassu & Kouam (2021)	COVID-19 leads to decrease of students' enrolment. Universities are installing more IT facilities and promote more IT related courses for students in post-COVID world.	Technological Advancements and COVID-19
Haley (2020)	Over time metropolitan students from less advantaged backgrounds have increasingly attended university colleges, particularly those whose qualifications excluded them from entering the more prestigious universities.	Socioeconomic Access
Delucchi et al. (2021)	It was found that additional workload of academic and non-academic staffs have no direct relationship to the addition of student enrollment.	Staff Workload and Enrollment
Wu et al. (2023)	Predictive model outputs a probability that students will enrol and thus helps admission committees more effectively select students.	Predictive Analytics in Admissions
Cherian et al. (2020)	There exists a clear association between entry grades and student retention for part-time students, which may aid policy makers, academics, university staff, and higher education stakeholders to develop appropriate strateg	Entry Grades and Retention
Eggers and Groothuis (2022)	The publicity of being named the top party school enhances a school's undesired reputation, thereby influencing student enrollment decisions, particularly among top-tier students.	Reputation and Enrollment Decisions
Zakariya et al. (2022)	Due to high student enrolment, The teaching is dominated by teacher-led instruction, note-taking, and large pieces of proof which make learning difficult for students during class activities. The results also show that the curri	Teaching Methodology and Feedback

Fig. 11 Themes Coded

In scrutinising the thematic codifications extrapolated from 17 studies, an incisive analysis delineates a spectrum of nuanced dynamics pervading the sphere of student enrollment in tertiary education. These themes, albeit heterogeneous, coalesce into a multifaceted tableau of determinants shaping enrollment propensities and institutional stratagems.

The theme of 'Institutional Offerings', as explicated by Chen et al. (2020), accentuates the exigency for educational establishments to augment their academic and administrative portfolios to fortify student enrollment. This premise gains further substantiation through Makki et al. (2022), who champion the utility of capacity planning frameworks in maximising enrollment potentialities. These insights collectively signify a paradigm shift towards strategic amelioration of institutional offerings, aimed at enticing and sustaining student populations.

Concurrently, studies into 'Policy and Demographics' (Kehal et al., 2021) and 'Student Characteristics' (Cortes et al., 2023) elucidate that enrollment is not solely contingent upon institutional directives but is intrinsically tethered to the expansive societal fabric, encompassing demographic evolutions and individual learner attributes. These revelations intimate that policies efficacious in one milieu might yield antithetical outcomes in another, underscoring the intricate equipoise institutions must maintain in policy orchestration and execution.

The repercussions of 'Technological Advancements and COVID-19', as articulated by Kamssu and Kouam (2021), highlight the accelerated metamorphosis of the higher education landscape. This necessitates a prompt embracement of informational technologies in pedagogical delivery, a transition that, albeit tumultuous, heralds a paradigm of innovation, potentially delineating the contours of post-pandemic educational praxis.

Studies into 'Learning Environment and Culture' (Zeng et al., 2023) and 'Teaching Methodology and Feedback' (Zakariya et al., 2022) underscore the pivotal influence of qualitative educational facets – such as ambience and pedagogy – in modulating enrollment. These findings suggest an emergent student predilection for educational ecosystems that transcend academic rigor to cultivate supportive and immersive learning cultures.

Discourses on 'Socioeconomic Access' and the impact of socio-political dynamics on enrollment, as elucidated by Bhatt (2021) and Haley (2020), underscore the imperative of accessibility and inclusivity in higher education. This challenges institutions to not only diversify their student cohorts but also to ensure the democratization of tertiary education across societal strata.

The burgeoning integration of 'Data Analysis and Predictive Models' in admissions (Pantachang et al., 2022; Wu et al., 2023) reflects an epochal shift towards data-centric recruitment methodologies. This trend mirrors a larger academic inclination towards empiricism and predictive analytics, potent in refining enrollment management via targeted and informed approaches.

Furthermore, 'Reputation and Enrollment Decisions' (Eggers and Groothuis, 2022) caution against the inadvertent ramifications institutional repute may exert on enrollment, underscoring the necessity for a nuanced comprehension of the interplay between institutional reputation and student predilections.

In summation, these studies furnish a multi-dimensional perspective on student enrollment, influenced by an amalgamation of institutional tactics, student demographics, pedagogical approaches, and external variables. The exigency for stakeholders in higher education lies in harmonising these diverse elements into cohesive strategies, congruent with their institutional ethos whilst adaptive to the ever-evolving educational landscape. This analysis highlights the imperative for a dynamic, comprehensive approach to enrollment management, attuned to the complexities of an increasingly variegated and globalised student body.

4. Discussion

The systematic literature review detailed in the article "University Student Enrolment Patterns from 2020 to 2023" offers a profound insight into the evolving landscape of higher education, particularly in the context of the seismic shifts induced by the COVID-19 pandemic. The discussions ensuing from this review are centered around several pivotal themes, each contributing to a nuanced understanding of contemporary trends and challenges in university enrollment.

One key area of discussion pertains to the transformation in educational policy and institutional strategy in response to the pandemic's impact. The rapid transition to online learning platforms, as necessitated by the pandemic, highlighted the urgent need for universities to rethink their pedagogical frameworks (Peters et al., 2020). This transformation extends beyond mere technological adoption, demanding a deeper pedagogical shift towards more flexible and inclusive educational models. Such models must be designed to cater to a diverse student body, accommodating varying learning styles and needs (Jimola & Ofodu, 2021).

Another significant theme emerging from the review is the intensified focus on socioeconomic factors and their influence on access to higher education. The pandemic has exacerbated existing

inequalities, making it imperative for universities to devise strategies to mitigate these disparities (Ismail et al., 2021). Initiatives like targeted outreach programs and scholarship opportunities are critical in ensuring broader and more equitable access to higher education, particularly for underrepresented and economically disadvantaged groups (Salmi & D'Addio, 2021)

The trend towards the internationalization of university education, as observed in the study, opens another avenue for discussion. The growing appeal of globalized education programs underscores the need for institutions to bolster their international engagement strategies (Garwe & Thondhlana, 2021). Such strategies should not only focus on attracting a diverse student cohort but also on embedding global perspectives within the curriculum, thereby enhancing the educational experience and cultivating global citizenship among students (Dobson et al., 2021).

Data-driven decision-making in enrollment management is yet another aspect that warrants attention. The increasing use of predictive analytics in understanding and responding to student enrollment patterns represents a significant shift towards a more evidence-based approach in higher education (Liz-Domínguez et al., 2019). Institutions leveraging these analytics can gain valuable insights into student behaviors and preferences, enabling them to tailor their offerings more effectively and improve student retention rates (Foster & Francis, 2019).

Furthermore, the quality of the learning experience and its impact on student satisfaction is a topic of considerable importance. The study's findings suggest that factors like campus facilities, faculty-student interaction, and extracurricular activities play a crucial role in influencing students' enrollment decisions (Chhetri & Baniya, 2022). Universities, therefore, need to focus on creating an enriching and supportive environment that fosters academic success and personal development (Schreiner et al., 2020).

Finally, the role of marketing and institutional branding in student recruitment emerges as a critical discussion point. In a highly competitive educational landscape, effective branding and strategic communication are essential in attracting and retaining students (Elken, 2020). Universities must articulate their unique value propositions clearly and compellingly to differentiate themselves and appeal to prospective students (Koowattanatianchai et al., 2023).

In conclusion, the discussions prompted by this systematic literature review are integral to understanding the complexities of university student enrollment in the contemporary era. The insights derived from this study call for a multifaceted approach, involving policy reform, technological innovation, and a steadfast commitment to inclusivity and excellence in higher education. As the landscape of higher education continues to evolve, these discussions will play a crucial role in shaping the future of university education, ensuring its relevance and sustainability in an increasingly interconnected world.

5. Implications

This review elucidates the multifarious implications for the realm of tertiary education. This period, significantly influenced by the global perturbations of the COVID-19 pandemic, presents a complex nexus of educational, socioeconomic, and technological factors that are reshaping university student enrolment (Saleem et al., 2024)

Foremost among these implications is the imperative for educational institutions to recalibrate their policies and strategic approaches. This recalibration necessitates a harmonious blend of academic rigour and flexibility, catering to an increasingly diverse student populace. This blend is crucial not only in academic offerings but also in the provision of financial aid and the facilitation of remote learning options, thereby addressing the eclectic needs of the student body (Singh et al., 2021). The pandemic has undeniably acted as a catalyst for the expedited adoption of digital pedagogies. This shift mandates a thorough re-evaluation of instructional methodologies, with an emphasis on the integration of technological advancements in education. Such integration is pivotal in ensuring both the continuity and the accessibility of education, especially in the face of potential future global disruptions.

Another critical aspect highlighted by the study is the intensification of socioeconomic disparities in accessing higher education. Universities are thus called upon to actively engage in reducing these disparities (Paulsen & McCormick, 2020). This engagement could manifest through dedicated outreach

initiatives and scholarship programs aimed particularly at underrepresented and economically disadvantaged demographics, ensuring equitable access to higher education.

The research also underscores a trend towards the internationalisation of university curricula. In this context, institutions are encouraged to augment their global engagement strategies (Crick & Crick, 2020). Such strategies are essential not only for attracting a heterogeneous international student cohort but also for enriching the educational milieu with diverse cultural perspectives, thereby fostering a broader understanding and appreciation of global interconnectivity. The evolving landscape of student enrollment management has seen a marked increase in the reliance on data analytics and predictive modelling (Umer et al., 2021). The adoption of these data-driven approaches empowers universities to gain deeper insights into enrollment patterns and student preferences. This knowledge, in turn, facilitates more informed and efficacious decision-making in both student recruitment and retention.

The quality of the learning experience, encompassing various facets such as campus infrastructure, pedagogical interactions, and extracurricular engagements, emerges as a pivotal factor in influencing students' enrollment decisions (Nepal & Rogerson, 2020). Universities are thus urged to prioritize the holistic development of their students, ensuring an environment that is not only supportive but also conducive to comprehensive intellectual and personal growth. The role of institutional branding and marketing in attracting prospective students is another significant finding of this review. Effective branding and communication strategies are indispensable for universities in articulating their unique educational propositions, thereby distinguishing themselves in a competitive academic landscape (Patrício & Ferreira, 2023).

Finally, the insights gleaned from this systematic review bear substantial implications for a spectrum of stakeholders in higher education, including policymakers, academic leaders, and governmental entities. A collaborative approach is paramount in this context, aiming to align educational offerings with the evolving demands of the labour market and the broader societal needs, thereby ensuring the sustainability and relevance of higher education institutions. In summation, this literature review provides an insightful perspective into the intricate dynamics governing university student enrollment. The derived implications necessitate a multifaceted and concerted approach, encompassing policy reforms, technological advancements, and an unwavering commitment to inclusivity and excellence in the domain of higher education.

6. Conclusion

The article reaches its denouement with an elucidative synthesis, encapsulating the multifarious impacts of global vicissitudes, particularly the COVID-19 pandemic, on the dynamics of university student enrollment. This conclusive section is a distillation of comprehensive insights derived from an astute analysis of the emergent trends, challenges, and burgeoning opportunities within the ambit of higher education during this epoch of unprecedented turmoil.

At the crux of this conclusion is the acknowledgment of the pandemic's role as a pivotal catalyst in the expedited digital metamorphosis of the higher education sector. The exigency of transitioning to online learning paradigms, propelled by global lockdown mandates, has critically interrogated conventional pedagogical methodologies while simultaneously unveiling the potentials and constraints inherent in virtual learning ecosystems (MacKenzie et al., 2022). This experience indubitably accentuates the imperative for academic institutions to perpetually foster innovation and integrate technological advancements in their educational repertoire, thereby ensuring resilience and adaptability in anticipation of future exigencies. Additionally, the conclusion poignantly highlights the intensification of socioeconomic disparities in accessing higher education, a phenomenon significantly exacerbated amidst the pandemic. The study advocates for the proactive engagement of universities in instituting measures to ameliorate these disparities. Such measures should encompass targeted outreach and support initiatives aimed at democratising education and ensuring equitable access for all societal strata (Neblett, 2019).

The escalation in the internationalisation of education forms another salient aspect of the conclusion. The study underscores the imperative for universities to augment their global engagement and

internationalisation strategies. Such endeavours are not solely aimed at cultivating a diverse student populace but are also pivotal in infusing the educational experience with a plethora of global perspectives and cross-cultural learning opportunities (Sjøen, 2023). Moreover, the conclusion acknowledges the burgeoning significance of data-driven decision-making in the realm of student enrollment management. The deployment of sophisticated analytics and predictive modelling has surfaced as an indispensable tool for academic institutions. These tools aid in deciphering and responding adeptly to enrollment trends and student predilections, thereby facilitating strategic and efficacious planning (Sghir et al., 2022).

The study further expounds on the paramount role of the overall quality of the learning experience as a determinant in student enrollment decisions. Aspects such as campus infrastructure, faculty-student interactions, and extracurricular activities are identified as crucial elements in enticing and retaining students, underscoring the necessity for universities to concentrate on the holistic development of their student body (Posselt et al., 2023). Finally, the conclusion broaches the topic of the substantial influence exerted by institutional branding and marketing within the competitive higher education landscape. Proficient communication and branding strategies are indispensable for universities to distinguish themselves and captivate prospective students. These strategies should emphasise the unique educational propositions and values of the institutions (Suprino & Sudarmiatin, 2023).

In essence, the conclusion of the article presents a nuanced and all-encompassing synthesis of the pivotal trends and challenges characterising university student enrollment patterns from 2020 to 2023. It advocates for a multi-pronged, progressive approach by higher education institutions, encompassing technological innovation, inclusivity, global engagement, data-driven strategies, and an emphasis on quality and branding. This approach is vital for navigating and flourishing in the evolving educational landscape. The conclusion not only offers invaluable insights for academic leaders and policymakers but also establishes a foundation for future scholarly inquiry and discourse in the domain of higher education.

7. Co-author contributions

Li Yan conceptualized the research framework and led the project. Charanjit Kaur Swaran Singh designed the methodology, including the systematic review protocol. Wong Wei Lun was responsible for data collection and management. Luo Junjie handled the statistical analysis and interpretation of the data. Shen Daoyuan primarily contributed to drafting and revising the manuscript. Each author played a distinct, integral role in the research, ensuring a comprehensive and methodologically sound study.

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