INTERNATIONAL JOURNAL OF MANAGEMENT THINKING (IJMT)

Vol.2, Issue.2, 2024

WWW. IJMTHK. COM

International Journal of Management Thinking (IJMT) is an open access, peer-reviewed international journal that deals with both applied and theoretical issues in the field of Management.

To be included in the journal, a manuscript must make empirical, theoretical, and methodological contributions in the field of management science.

Generally, accepted papers will appear online within 2-3 weeks. The journal publishes original papers including but not limited to the following fields:

- Management Thinking
- Leadership and Management
- Project Management
- Operations Management
- Supply chain Management
- Organizational management
- Education Management
- Economic Thinking
- Environmental management
- Construction management
- Tourism management
- Human resource management
- Natural resource management
- Waste management
- Water Management
- Flood Management
- Information Management
- Learning management
- Data Management

International Journal of Management Thinking (IJMT) operates through the peer-review process and is associated with United Frontiers Publisher. It is not associated with or does not represent any governmental, non-governmental organization, or any public or private university.

Table of Contents

Assessing and Enhancing Core Competencies in Vocational Education: A Case Study of Senior Students at Guangxi Police College, China

Mo Huina[1], Savitri Chitbanchong[2], Nuttamon Punchatree[3], Sirapob Thepphitak[4]

[1-4] Bansomdejchaopraya Rajabhat University, Bangkok, Thailand

Article Information	ABSTRACT
  Corresponding Author: Savitri Chitbanchong savitri.nan@gmail.com https://orcid.org/0009-0006-0683-9773	This study evaluates the core competencies of senior students at Guangxi Police College within the framework of higher vocational education and provides guidelines for enhancing these skills. A Likert 5-Point Scale questionnaire based on Lin Chongde's 2017 framework assessed these competencies among 155 students. A statistical study of the data, concentrating on mean values and standard deviations, indicated variable levels of competence across six dimensions: moral awareness, social responsibility, cultural comprehension, critical thinking, language competency, and aesthetic appreciation. They demonstrated high levels of ethical awareness, social responsibility, cultural understanding, critical thinking, and aesthetic appreciation, while language abilities were graded as medium, indicating a need for targeted improvement. Recommendations include incorporating interactive language activities and industry-specific training, targeting critical thinking through case studies and debate clubs, broadening cultural understanding through international exposure, cultivating aesthetic appreciation through art classes, and increasing social responsibility through community service and internships. Integrating ethics education across all disciplines and practical ethical dilemma workshops were suggested to promote moral awareness. This study presents a complete examination of basic abilities in a vocational environment and offers actionable suggestions for educational improvement. This paper addresses the critical gap in creating vocational training programs for police officers. It focuses on police students' vocational education and provides a detailed assessment of fundamental abilities adapted for law enforcement training. The study findings give an insightful overview of the viable future revisions in vocational programs that match the educational requirements and practical demands of the police profession. **Keywords:** Core Competencies; Vocational Education; Guangxi Police College; Moral Awareness; Social Responsibility

1. INTRODUCTION

Core competencies have gained significant attention in educational discourse in a rapidly evolving societal landscape. With a particular focus on vocational education, the education system prepares students for specific career paths (Smith & Lee, 2020). Alongside developing a particular skill set or acquiring competency or knowledge required for a particular occupation, vocational education also pays attention to core competencies.

Core competencies, including moral awareness, social responsibility, cultural understanding, critical thinking, aesthetic appreciation, and language proficiency, are essential for equipping students with the skills needed to excel in their professions and acquire an impeccable character in society. These competencies prepare students for the technical demands of their careers but also foster essential soft skills like ethical decision-making and community engagement (Jones & Brown, 2018). Lin's (2017) study identified cultural heritage, self-cultivation, social involvement, and autonomous learning as essential competencies. Lin's theory consists of three domains: cultural foundation, independent development, and social participation. These domains subsume techniques that incorporate curricular integration, holistic evaluation, and collaborative teaching in the curriculum and prepare students for modern societal concerns.

A study by Zhang et al. (2019) investigates the challenges of enhancing core competencies in police training, including critical thinking, decision-making, and interpersonal skills. The report addresses options for addressing these obstacles, such as curricular revisions, updated training methodologies, and improved incorporation of genuine scenarios. It underlines the importance of continuously enhancing training programs to meet the changing demands of law enforcement. Similarly, Zhang's (2023) paper probes the difficulty of aligning vocational education with industry expectations. It focuses on rapid technological development, curricular gaps, and ineffective collaboration between educators and industries. Zhang recommends continuous interaction with corporate executives, curriculum revisions, and higher partnerships to keep vocational education relevant. The report also discusses Guangxi Police College's challenges in modernizing its curriculum, particularly in teaching methods and essential skill development. Zhang emphasizes the importance of curriculum changes and industry-education collaboration to enhance student readiness and job prospects.

Liu (2022) investigates creative teaching strategies in vocational education, proving to be a valuable contributor to improving the learner's overall competency. A case study by Liu (2022) sheds light on this aspect. It emphasizes incorporating technology, problem-based learning and collaborative projects to increase student engagement and skill acquisition. The study found that these strategies improved vocational students' practical abilities, critical thinking, and collaboration. Liu argues that creative teaching methods are crucial for connecting vocational education with industry demands and preparing students for the workforce.

Furthermore, to evaluate core competency training at Guangxi Police College, Wang and Chen (2023) conducted surveys and interviews. The study found a significant increase in communication, cooperation, and problem-solving abilities, particularly in practical contexts. The researchers found that including core competencies in vocational training improves students' preparation for professional positions. Likewise, Li (2024) discusses the current state of vocational education in China, noting issues such as obsolete curricula and weak industry linkages. The study suggests updating curricula, strengthening business relationships, and reforming policies to better connect vocational training with market demands.

An action plan, "Quality Improvement and Excellence Action Plan for Vocational Education (2020—2023)", was formulated by the Ministry of Education of China (2020), which discusses ways to improve vocational education quality. The initiative focuses on raising curricular standards, fostering industrial collaboration, and modernizing teaching methods. The goals of this action plan involve enhancing educational standards, combining practical training with industry needs and encouraging innovation to link vocational programs with modern worker demands.

Gao (2006) documented China's national demonstration project for higher vocational institutions, and it focuses on advancing reforms in higher vocational education to increase quality and correspond with economic demands. Curriculum enhancement, industry partnerships, and teaching style innovation represent some of the primary strategies. The document promotes model colleges and encourages national adoption of best practices to enhance professional development. This comprehensive overview enlightens us about the various aspects of core competencies and their overarching merits. It ultimately paves the way for this study to address the gap in the existing core competencies among senior students at Guangxi Police College. Moreover, it suggests a structured development plan.

The goals of this research are to analyze the existing core competencies among senior students at Guangxi Police College and to make practical recommendations for enhancing these core abilities within the higher vocational education framework. Furthermore, this study is essential because it tackles severe deficiencies in the vocational education system for police training at Guangxi Police College. It emphasizes the growing demand for law enforcement officials to have a variety of competencies such as moral awareness, social responsibility, critical thinking, cultural knowledge, aesthetic appreciation, and linguistic ability. With an increasing propensity for such competencies, there is a rise in job demands with holistically competent employees. Despite national reforms, there must still be a disconnection between educational outputs and industry demands. By assessing these competencies and highlighting areas for growth, the study provides insights for improving vocational education and better-preparing students for the challenges of modern police. The program prioritizes holistic development and practical curriculum reforms to provide future law enforcement officers with the necessary skills to successfully and responsibly address social concerns.

This study is crucial because it addresses the need to improve vocational education, particularly for police training at Guangxi Police College. As the demands on law enforcement personnel become more complicated, officers must learn a wide range of core capabilities that extend beyond traditional technical skills. This study assesses competencies such as moral awareness, social responsibility, critical thinking, cultural understanding, aesthetic appreciation, and language proficiency, emphasizing a comprehensive approach to education that prepares students for the multifaceted challenges of modern law enforcement. By identifying gaps between current educational processes and industry needs, the study gives practical insights for better aligning training programs with the profession's changing expectations.

2. LITERATURE REVIEW

2.1 Concept of Core Competency in Vocational Education

The concept of core competencies was introduced in 1990 by Prahalad and Hamel. They defined core competencies as "the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies". The Core Competencies for Student Development in China was officially released in 2016 by a team led by Professor Lin Chongde of Beijing Normal University. This research achievement was commissioned by the Ministry of Education for Beijing Normal University to work with nearly a hundred experts from universities across China over three years to complete (Wang et al., 2021; Lin, 2017). Technical universities were assessed to identify the core abilities of electrical engineering and computer science (EECS) students during their academic journeys. They outlined the primary stages for improving competency development and suggested a better-connected curriculum with industry needs (Chang et al., 2023). Chen et al. (2024) examines competence-based techniques in Russian and Chinese vocational education programs, focusing on commercial training.

They noticed that Russian courses emphasize theoretical knowledge and standardization, whereas Chinese ones concentrate on practical skills and flexibility, reflecting each country's unique educational and economic interests. In another significant research study to observe the development of competency-based education in China, Zhao (2020) criticized the emphasis on critical competencies in Chinese education, claiming that it falls short of promoting holistic development. The study identifies obstacles in implementing competency-based education, such as an excessive focus on measurable abilities at the expense of larger educational objectives. The study advocates for a method that combines skill development with a growth of values, creativity, and emotional wellbeing. Researchers have begun constructing frameworks for core professional competencies based on different perspectives and needs for an extended period.

2.2 Chinese Students' Core Competencies

The study's variables investigated the current level of core competencies among senior students at Guangxi Police College. These variables were derived from Lin's (2017) research on Chinese students' core competencies. Lin's study comprehensively addresses various aspects of student development and provides a framework for understanding core competencies in Chinese education.

2.2.1 Language Skills

Wilson and Bishop (2021) used an innovative online assessment questionnaire to distinguish pragmatic and core language skills (grammar and vocabulary) in children aged 7 to 13. They discovered that, while these skills are unique, they are interconnected, with each domain facilitating the development of the other. They suggested considering pragmatic skills as a broad group of abilities rather than a single area, emphasizing the complexities of language development. Meanwhile, Park (2022) studied the effect of technology-enhanced language learning (TELL) on teachers' competencies, finding it beneficial in improving problem-solving and convergent thinking for effective classroom management and student learning outcomes. Likewise, Wang and Luo (2019) analyzed the 2017 adjustment to China's senior middle school English curriculum requirements. It considered shifting from traditional topic teaching towards improving students' fundamental abilities through English language instruction. The updated standards emphasized critical thinking, cultural awareness, and communicative skills to develop well-rounded, globally capable individuals. The researchers examined how these changes mirror broader educational reforms in China to align English instruction with the country's changing educational objectives.

2.2.2 Critical Thinking Skills

Giselsson (2020) highlighted the challenges children with language impairments face in developing verbal pragmatic skills, showing significant discrepancies compared to their peers. Concurrently, Rodzalan et al. (2020) presented evidence that concept mapping outperforms traditional teaching methods in fostering students' critical thinking abilities, with a more pronounced effect in randomized study settings. Lv et al. (2022) conducted a longitudinal investigation on the relationship between student engagement and critical thinking among Chinese upper vocational college students. According to the findings, higher levels of student engagement are positively associated with the long-term development of critical thinking skills. The study emphasized encouraging students to participate in academic activities to improve their critical thinking skills in vocational education settings.

2.2.3 Cultural Understanding

Kong and Sung (2020) analyzed the representation of cultural content in secondary English textbooks, advocating for a balanced approach that fosters cultural pride and openness. Park et al. (2022) found that effective communication and self-awareness are pivotal in enhancing nursing students' caring capabilities, thus improving their professional competencies. Furthermore, Hui and Cheung (2015) investigated the effect of cultural literacy on student participation in technical and vocational education and training (TVET) in Hong Kong. They discovered that higher levels of cultural literacy correlate with improved student engagement, implying that incorporating cultural understanding into TVET programs can boost students' enthusiasm and interest. The study underlines the importance of cultural literacy in raising educational outcomes in vocational contexts.

2.2.4 Aesthetic Appreciation

Aesthetic education plays a crucial role in the holistic development of students by fostering an appreciation for beauty, creativity, and emotional growth across various educational settings. Wang et al. (2022) emphasize the significant impact of art and music education on developing aesthetic appreciation, which not only enhances creative thinking but also fosters innovation. Yuan et al. (2023) illustrate how sports aesthetic education is instrumental in developing core literacy among students. He (2022) looks at the abilities, traits, and talents needed for employment among Chinese graduates with undergraduate degrees in fine art in China's creative industries. It emphasizes crucial factors such as inventiveness, technical proficiency, adaptability, and networking talents as essential for obtaining a job. Its study also stresses the disparity between academic training and industry demands, implying that graduates must possess artistic and professional skills to flourish in the competitive creative sector.

2.2.5 Social Responsibility

Wevers and Voinea (2021) explored the elements of corporate social responsibility (CSR) that are crucial in crafting sustainable business models for social start-ups, and they examined the evolution of social responsibility in universities, linking it to broader social impacts and institutional strategies. Similarly, Lu et al. (2019) investigated the significance of social responsibility for employees in fostering career development and sustainability during China's manufacturing revolution. The study found that firms prioritize employee wellbeing, such as training and career progression chances, contributing to long-term career growth and organizational performance. They suggest that socially responsible practices are critical for maintaining employee engagement and adaptation in an ever-changing industrial context.

2.2.6 Moral Awareness

Spekkink and Jacobs (2020) explored educational strategies to enhance moral sensitivity among nursing students, identifying key dimensions contributing to ethical decision-making. Similarly, Nita et al. (2022) studied moral reasoning in accounting students, emphasizing the role of individual and contextual factors in shaping ethical behaviours. Deng and Zhengmei (2023) perform a comparative examination of important competency frameworks in China and the United States, focusing on the importance of moral versus skill priority. They report that China's framework prioritizes moral education and collective ideals, whereas the United States' framework focuses on individual abilities and practical competencies. They emphasize how these variances reflect each country's broader cultural and educational ideologies, which influence the implementation of competency-based education.

2.3 Enhancing Vocational Core Competencies in Higher Education

This section consolidates strategies and research findings on improving the core competencies of students in vocational colleges to prepare them for the workforce. Chen (2019) emphasizes incorporating basic vocational skills into college curricula to fulfil industrial demands. Hua and Zeng (2019) construct outcome-oriented programs to promote occupational competencies. Xie (2019) investigates how professional dedication influences the vocational core competencies of higher vocational students and focuses on the mediation function of learning engagement. Study findings show enhanced professional dedication and improved learning engagement and capabilities.

Xiao (2021) suggests a "four-in-one" mechanism integrating practical teaching with systemic curriculum approaches. Through empirical research, Lu et al. (2019) explore the competencies needed for high-quality talents in the information age. (Byoun & Han 2022) and (Kwon & Kim 2022) elaborate on methods to enhance professional training and learning outcomes through innovative educational frameworks and community learning initiatives. Transitioning the implementation of these competencies, Qiu (2024) proposed a unique teaching model focused on core literacy for vocational English. Jiang (2024) highlighted the need for core literacy in I.T. courses, including information awareness and digital innovation. Ma (2020) examines the essential competencies required by the service industry in Jiangxi Province, emphasizing professional ethics and technological skills. Lastly, Shi et al. (2021) and Xie et al. (2023) discuss the impact of blended learning and the cultivation of innovative behaviours through enhanced vocational core competencies, stressing the importance of aligning educational strategies with professional standards and student innovation.

3. METHODOLOGY

3.1 Study design

This study employs a quantitative approach, namely ordinal, with ranked responses to evaluate fundamental abilities among students enrolled in vocational speciality programs at Guangxi Police College. It used a cross-sectional design with a Chinese-language Likert 5-Point scale questionnaire administered at a single point, resulting in cross-sectional data that does not monitor changes over time to assess abilities in linguistic skills, critical thinking, cultural comprehension, artistic appreciation, social responsibility, and moral and ethical awareness. Each dimension was thoroughly evaluated, with ten questions ensuring a comprehensive examination of each topic. These six core skills depend on Lin's (2017) research on Chinese students' core competencies, which provides a framework uniquely adapted to the Chinese educational setting. Furthermore, the "Guideline for Developing Core Competencies at Guangxi Police College, China" specifies guidelines for this examination.

3.2 Ethical Consent

All Guangxi Police College students were informed about the study's objectives and intended usage in the researchers' master's thesis and journal publication. An online questionnaire was implemented to acquire informed consent. The study's ethical components were examined and authorized by Bansomdejchaopraya Rajabhat University, where the researcher is studying for a master's degree.

3.3 Target Population

The study included 254 senior students from the Traffic Management Engineering College at Guangxi Police College. A sample of 155 students was drawn through simple random sampling, as defined by Krejcie and Morgan (1970).

3.4 Data Collection and Analysis

The questionnaires were modified using Wen Juan Wang (www.wenjuanwang.com) and distributed via WeChat, with the study's purpose communicated to participants. The completed questionnaires were collected as selected samples and screened to exclude invalid responses for data analysis. Data analysis involved calculating frequencies, percentages, means, and standard deviations to understand the distribution of responses and the general agreement level among participants. The data interpretation for the average values is as follows, based on Likert (1932).

➢ 4.50 - 5.00: Agrees at the highest level.
➢ 3.50 - 4.49: Expresses high-level agreement.
➢ 2.50 - 3.49: Expresses medium-level agreement
➢ 1.50 - 2.49: Expresses low-level agreement
➢ 1.00 - 1.49: Indicates agreement at the lowest level.

These ranges indicate how strongly participants agree with the items on the Likert scale. The content validation process for the research instruments involved a review by three independent experts. Gathered expert opinions and feedback to refine and finalize the questionnaire items. All questions display consistency with the measurement target, as proven by an average score between 0.67 and 1.00 on the acceptable consistency index (IOC).

4. RESULTS AND ANALYSIS

4.1 Demographic Information of the Respondents

Table 1 presents data from 155 respondents. There were 85 men (54.84%) and 70 women (45.16%). Regarding their majors, 102 respondents (65.80%) were in urban rail transit safety technology management, while 53 (34.19%) were in Civil Aviation Safety Technology Management.

Table 1. Demographic Information of the Respondent

Item	Option	Frequency	Percentage (%)
Gender	Male	85	54.84
	Female	70	45.16
Major	Urban Rail Transit Safety Technology Management	102	65.80
	Civil Aviation Safety Technology Management	53	34.19

4.2 Descriptive Analysis

The study employed means and standard deviations to assess students' levels of agreement on a Likert scale, with scores ranging from 1.00 (lowest) to 5.00 (highest).

As stated in Table 2, the average score for core abilities across 155 students was 3.87, indicating great success in most domains. Furthermore, it can be observed in Table 2 that students got high scores in moral awareness, social responsibility, cultural understanding, critical thinking, and aesthetic appreciation. However, language skill was assessed as a medium, with an average score of 3.49, indicating that it is an area that needs improvement.

Table 2. Mean (x̄) and Standard Deviation (S.D.) of Core Competencies among Six Dimensions

Dimension	x̄	S.D.	Level	Rank
Language Skill	3.49	1.08	Medium	6
Critical Thinking Skill	3.89	1.02	High	4
Cultural Understanding	3.99	0.97	High	3
Aesthetic Appreciation	3.78	0.78	High	5
Social Responsibility	4.03	0.99	High	2
Moral Awareness	4.05	0.93	High	1

Table 3 ranks 155 respondents' language skills from highest to lowest. The overall average score is 3.49 (standard deviation = 1.08). The top skill is successful collaboration (x̄ = 3.93, S.D. = 1.05), followed by reading complicated Chinese texts and actively seeking language progress (x̄ = 3.86, S.D. = 1.05). Passing a language competency test ranks fifth (x̄ = 3.66, S.D. = 1.17) and understanding industry jargon comes fourth (x̄ = 3.84, S.D. = 1.07). Understanding worldwide viewpoints (x̄ = 3.33, S.D. = 1.04) and practical use of English (x̄ = 3.14, S.D. = 1.04) rank sixth and seventh respectively. Comfort in technical English talks (x̄ = 3.13, S.D. = 1.03) and comprehension of vocational materials in other languages (x̄ = 3.12, S.D. = 1.05) rank eighth and ninth. The ability with the lowest ranking is proficiency in a second language other than English (x̄ = 3.03, S.D. = 1.11).

Table 3. Mean (x̄) and Standard Deviation (S.D.) of Language Skill

Language Skill	x̄	S.D.	Level	Rank
I have passed a recognized language proficiency test (e.g. Pre-intermediate English，CET-4 or CET-6) in English.	3.66	1.17	high	5
My English language skills aid in my understanding of international perspectives in my vocational field.	3.33	1.04	medium	6
I am able to understand and interpret complex Chinese texts related to my vocational field.	3.86	1.05	high	2
My language skills enable me to collaborate effectively with others in my field.	3.93	1.05	high	1
I am proficient in a second language except English.	3.03	1.11	medium	10
I frequently use my English language skills in practical vocational scenarios.	3.14	1.04	medium	7

Language Skill	x̄	S.D.	Level	Rank
I am comfortable engaging in technical discussions in English within my vocational field.	3.13	1.03	medium	8
I regularly read and comprehend vocational materials in languages other than my native tongue and English.	3.12	1.05	medium	9
I actively seek opportunities to improve my language skills that are relevant to my profession.	3.86	1.17	high	3
My language proficiency allows me to interpret industry-specific jargon and terminology effectively.	3.84	1.07	high	4

Table 4 shows the mean and standard deviation of critical thinking skills for 155 respondents, with an overall mean of 3.89 (S.D. = 1.02), indicating a high significance of critical thinking. The highest-ranked talent frequently questions assumptions and seeks different views (x̄ = 3.96, S.D. = 1.04). It is followed by effectively using critical thinking to solve real-world problems (x̄ = 3.94, S.D. = 0.99) and critically examining vocational approaches (x̄ = 3.90, S.D. = 0.99). Identifies source credibility and evaluates information reliability (x̄ = 3.90, S.D. = 1.00 and 1.06) rank fourth and fifth, respectively. Synthesizing information from multiple sources rates sixth (x̄ = 3.89, S.D. = 1.03), while developing unique solutions ranks seventh (x̄ = 3.88, S.D. = 0.98). Participating in critical thinking discussions ranks seventh (x̄ = 3.88, S.D. = 1.00), followed by identifying underlying principles (x̄ = 3.87, S.D.= 1.02), and independent thinking to question instructors (x̄ = 3.86, S.D. = 1.06).

Table 4. Mean (x̄) and Standard Deviation (S.D.) of Critical Thinking Skill

Critical Thinking Skill	x̄	S.D.	Level	Rank
I am confident in my ability to evaluate the reliability and validity of information.	3.90	1.06	high	5
I can synthesize information from various sources to form a coherent understanding.	3.89	1.03	high	6
I regularly question assumptions and explore alternative perspectives in my studies.	3.96	1.04	high	1
I am skilled at identifying the underlying principles in complex vocational scenarios.	3.87	1.02	high	9
I can think independently and challenge my instructor's perspectives in my vocational area.	3.86	1.06	high	10
I effectively apply critical thinking to solve real-world problems in my vocational field.	3.94	0.99	high	2
I can critically analyze and evaluate the strengths and weaknesses of different vocational approaches.	3.90	0.99	high	3
I frequently engage in discussions that challenge my critical thinking in vocational subjects.	3.88	1.00	high	8
I can formulate innovative solutions by applying critical thinking to vocational challenges.	3.88	0.98	high	7

Critical Thinking Skill	x̄	S.D.	Level	Rank
I assess the credibility of sources when researching vocational topics.	3.90	1.00	high	4

Table 5 shows the mean and standard deviation of cultural knowledge skills across 155 respondents, with an overall mean of 3.99 (SD = 0.97), suggesting significant cultural understanding. The most important skill is knowing how cultural differences affect professional practices (x̄ = 4.06, S.D. = 0.95), followed by enjoying and valuing cultural variety (x̄ = 4.05, S.D. = 0.99). Active participation in intercultural events scores third (x̄ = 4.03, S.D. = 0.97). Understanding other cultures and changing communication techniques rank fourth (x̄ = 4.02, SD = 0.95). Cultural competence's importance in global markets is ranked sixth (x̄ = 4.02, S.D. = 0.98). Collaborating with people from different backgrounds is ranked eighth (x̄ = 3.97, S.D. = 0.98), followed by negotiating and mediating in varied settings (x̄ = 3.96, S.D. = 0.95). Recognizing cultural impacts on decision-making rates ninth (x̄ = 3.95, S.D. = 0.99), while understanding the global and local cultural concerns ranks tenth (x̄ = 3.87, S.D. = 1.04).

Table 5. Mean (x̄) and Standard Deviation (S.D.) of Cultural Understanding

Cultural Understanding	x̄	S.D.	Level	Rank
I appreciate and respect cultural diversity in the workplace.	4.05	0.99	high	2
I understand the impact of cultural differences on professional practices.	4.06	0.95	high	1
I can adapt my communication style to suit diverse cultural contexts.	4.02	0.95	high	4
I know the global and local cultural issues affecting my vocational field.	3.87	1.04	high	10
I actively seek to understand and engage with cultures different from my own.	4.02	0.95	high	4
I can effectively collaborate with individuals from diverse cultural backgrounds in vocational projects.	3.97	0.98	high	7
I understand how cultural differences can influence decision-making in my vocational field.	3.95	0.99	high	9
I actively participate in multicultural events to enhance my cultural understanding.	4.03	0.97	high	3
I can negotiate and mediate in culturally diverse vocational environments.	3.96	0.95	high	8
I recognize the importance of cultural competence in global vocational markets.	4.02	0.98	high	6

Table 6 displays the mean and standard deviation of aesthetic appreciation skills among 155 respondents, with an average of 3.78 (SD = 0.78). The most important talent is appreciating aesthetics' significance in improving vocational products (x̄ = 4.10, S.D. = 0.99). The study found that the impact of self-image on job performance ranked second (x̄ = 4.05, S.D. = 1.04). Confidence in aesthetic appreciation outside the professional area scores third (x̄ = 4.01, S.D. = 0.95), while enjoying and evaluating design features ranks fourth (x̄ = 4.00, S.D. = 0.95). Regularly engaging in activities that improve aesthetic sensitivity ranks fifth (x̄ = 3.94, S.D. = 0.97).

Valuing invention and innovation is ranked sixth ($\bar{x}$ = 3.59, S.D. = 0.96), followed by critically analyzing aesthetic excellence ($\bar{x}$ = 3.55, S.D. = 1.03) as seventh in ranking. Understanding aesthetics' impact on customer perceptions ($\bar{x}$ = 3.51, S.D. = 0.98) as eight and examining aesthetic ideals across cultures rank ninth ($\bar{x}$ = 3.51, S.D. =0.97) respectively. Discussions on aesthetics rank tenth ($\bar{x}$ = 3.50, S.D. = 0.97).

Table 6. Mean ($\bar{x}$) and Standard Deviation (S.D.) of Aesthetic Appreciation

Aesthetic Appreciation	$\bar{x}$	S.D.	Level	Rank
I recognize the impact of self-image and appearance on job performance and opportunities in my vocational field.	4.05	1.04	high	2
I understand the role of aesthetics in enhancing the functionality of vocational products.	4.10	0.99	high	1
I value creativity and innovation in the design and execution of vocational tasks.	3.59	0.96	high	6
I can critically assess the aesthetic quality of work in my vocational area.	3.55	1.03	high	7
Beyond my professional field, I am confident in my aesthetic appreciation of fine arts, movies, music, etc.	4.01	0.95	high	3
I actively discuss the aesthetic aspects of vocational products and services.	3.50	0.97	high	10
I understand how aesthetics influence consumer perceptions in my vocational field.	3.51	0.98	high	9
I can appreciate and critique the design elements in vocational work settings.	4.00	0.95	high	4
I often explore how aesthetic values are expressed differently across various cultures in my vocational context.	3.51	0.97	high	8
I regularly participate in activities that enhance my aesthetic sensitivity and creativity.	3.94	0.97	high	5

Table 7 shows the social responsibility of 155 respondents, with an aggregate mean of 4.03 (SD = 0.99), implying strong social responsibility. Colleges provide the most internship chances ($\bar{x}$ = 4.10, S.D. = 0.99), followed by opportunities for social activities ($\bar{x}$ = 4.05, S.D. = 0.98). Active engagement in community and civic activities ($\bar{x}$ = 4.05, S.D. = 1.05) and analyzing organizational social duties ($\bar{x}$ = 4.02, S.D. = 0.97) are highly recognized. Understanding the social impact of occupational activities ($\bar{x}$ = 4.02, S.D. = 0.99) and advocating for socially responsible practices ($\bar{x}$ = 4.01, S.D. = 0.95) are equally important. Awareness of sustainable practices ($\bar{x}$ = 4.01, S.D. = 0.97) and volunteering for vocational skills ($\bar{x}$ = 4.00, S.D. = 1.01) are significant. Understanding the ethical and societal ramifications of one's vocational field ranks lowest ($\bar{x}$ = 3.98, S.D. = 1.01) but is nonetheless significant.

Table 7. Mean ($\bar{x}$) and Standard Deviation (S.D.) of Social Responsibility

Social Responsibility	x̄	S.D.	Level	Rank
My college provides opportunities to engage in social activities.	4.05	0.98	high	2
My college provides opportunities to engage in internships.	4.10	0.99	high	1
I actively participate in community and civic activities related to my vocational area.	4.05	1.05	high	3
I actively participate in community and civic activities in other fields.	4.01	1.01	high	8
I understand and actively address my vocational field's ethical and social implications.	3.98	1.01	high	10
I understand the social impact of my vocational practices on the community.	4.02	0.99	high	5
I regularly participate in volunteering activities related to my vocational skills.	4.00	1.01	high	9
I am conscious of the sustainability practices within my vocational field.	4.01	0.97	high	7
I can critically evaluate the social responsibilities of organizations in my vocational area.	4.02	0.97	high	4
I advocate for socially responsible practices within my vocational community.	4.01	0.95	high	6

Table 8 shows the mean and standard deviation of moral awareness among 155 respondents, with an average of 4.05 (SD = 0.93). The most important feature is implementing ethical concepts in real-world settings (x̄ = 4.09, S.D. = 0.91), followed by recognizing the repercussions of unethical behaviour (x̄ = 4.08, S.D. = 0.94). Promoting ethical behaviour among peers and updating information on ethical practices was ranked third (x̄ = 4.07, S.D. = 0.92). Moral and ethical education at college (x̄ = 4.06, S.D. = 0.97), reflecting on personal values relative to ethical norms (x̄ = 4.05, S.D. = 0.90), and identifying and addressing ethical difficulties (x̄ = 4.05, S.D. = 0.94) are also significant. It is vital to be aware of ethical standards in the vocational sector (x̄ = 4.04, S.D. = 0.92) and participate in moral and ethical conversations (x̄ = 4.02, S.D. = 0.93). The lowest element is knowing legal and ethical regulations in the vocational sector (x̄ = 3.99, S.D. = 0.92), but it remains significant.

Table 8. Mean (x̄)and Standard Deviation (S.D.) of Moral Awareness

Moral Awareness	x̄	S.D.	Level	Rank
I have received a moral and ethical education during my time at college.	4.06	0.97	high	5
I actively promote ethical behaviour among my peers.	4.07	0.92	high	3
I am aware of the ethical standards and expectations in my vocational field.	4.04	0.92	High	8
I understand the consequences of unethical behaviour in my professional activities.	4.08	0.94	High	2

Moral Awareness	x̄	S.D.	Level	Rank
I can apply ethical principles to the real world.	4.09	0.91	High	1
I regularly reflect on how my values align with the ethical standards of my vocational field.	4.05	0.90	High	6
I can identify and address ethical dilemmas in vocational situations.	4.05	0.94	High	7
I participate in forums or discussions on moral and ethical issues in my profession.	4.02	0.93	High	9
I clearly understand the legal and ethical regulations in my vocational sector.	3.99	0.92	High	10
I actively seek to update my knowledge about ethical practices and standards in my profession.	4.07	0.92	High	3

4.3 Discussion

Core competencies of moral awareness, social responsibility, cultural understanding, critical thinking, aesthetic appreciation, and language proficiency are required in vocational education to prepare students for specific careers. Soft skills such as ethical decision-making are required to acquire a well-rounded character for modern-world needs. In China, the "Core Competencies for Student Development" framework (Lin, 2017) emphasizes holistic development but confronts issues such as misalignment with industry needs and insufficient practical training. Some nationwide changes were also made, such as the "Quality Improvement and Excellence Action Plan for Vocational Education" (Ministry of Education of China, 2020). Yet Guangxi Police College, critical for training law enforcement officers, has outmoded teaching techniques and prevalent skill gaps. This study assesses core competencies among senior students at Guangxi Police College and recommends ways to improve vocational education and prepare students for modern problems (Smith & Lee, 2020; Zhang et al., 2019).

This study employs a quantitative approach to evaluate essential talents among senior students in vocational programs at Guangxi Police College. A Likert 5-Point Scale questionnaire in Chinese was created to assess competencies in six areas: linguistic skills, critical thinking, cultural comprehension, artistic appreciation, social responsibility, and moral and ethical awareness. The questionnaire, based on Lin Congde's 2017 research and the "Guideline for Developing Core Competencies at Guangxi Police College," featured ten questions for each dimension. The study used simple random sampling to select 155 of 254 students from the Traffic Management Engineering College. Data were obtained via WeChat and evaluated by Wen Juan Wang, who estimated frequencies, percentages, means, and standard deviations. The study has provided vital insights into the current proficiency levels and identified strategic measures for enhancement. Given the dynamic nature of vocational fields, this research supports the need for targeted interventions to refine and advance these competencies. These guidelines aim to elevate the existing core competencies and prepare students to meet the evolving demands of their professional fields, ensuring they are well-equipped for future challenges.

The results of the data tables and the literature review are consistent. The study's high overall core competencies (M = 3.87, S.D. = 0.96) are compatible with Lin's (2017) concept of core competencies in Chinese vocational education. Moral awareness ratings were notably high (mean = 4.05, S.D. = 0.93),

particularly in applying ethical principles in real-world circumstances (mean = 4.09), which is corroborated by Spekkink and Jacobs (2020) and Nita et al. (2022), both of which underline the importance of moral education and ethical decision-making. Social responsibility also received a good score (mean = 4.03, SD = 0.99), with high ratings for internships and community participation, the finding consistent with Lu et al. (2019) and Wevers and Voinea (2021), who emphasize the importance of social responsibility in career development and organizational performance.

Cultural understanding was considerable (mean = 3.99, S.D. = 0.97), with the highest ranking for understanding cultural implications on practices (mean = 4.06), supporting findings by Kong and Sung (2020) and Hui and Cheung (2015) in emphasizing the importance of cultural literacy in vocational education. Critical thinking abilities were also highly regarded (mean = 3.89, S.D. = 1.02), notably in terms of challenging assumptions and solving real-world situations, which is consistent with the findings of Rodzalan et al. (2020) and Lv et al. (2022), who highlight critical thinking and involvement. Aesthetic appreciation (mean = 3.78, SD = 0.78) was strong, particularly in understanding aesthetics in vocational goods (mean = 4.10), which is consistent with the results put forth by Wang et al. (2022) and Yuan et al. (2023), who examined the impact of aesthetic education on creativity and innovation. Language abilities were graded as medium (mean = 3.49), focusing on successful teamwork and complicated text reading. This signifies the results proposed by Wilson and Bishop (2021) and Park (2022), where both studies emphasized the importance of language skills in occupational contexts. Overall, the study's findings focus on the importance of the core competency framework and opportunities for future growth in vocational education.

4.4 Implications of the Study

The study's consequences are broad, affecting numerous facets of vocational education. The study emphasizes the need for a comprehensive approach to vocational education and recommends changing curriculum design, teaching techniques, and policymaking to improve student results. The findings imply that curriculum makers at Guangxi Police College and similar institutions should improve programs by focusing on core abilities, including language skills and cultural knowledge. A balanced educational approach should include linguistic abilities, critical thinking, cultural proficiency, aesthetic appreciation, social responsibility, and moral awareness to prepare students for professional challenges. The report also emphasizes the need for practical skills with real-world applications in vocational programs and a closer alignment between academic training and industrial requirements. Furthermore, the findings have policy implications, prompting policymakers to examine and change present competency frameworks and make relevant improvements. Moreover, the findings suggest rethinking and changing present competency frameworks to support vocational education objectives. Future research should focus on developing and accessing core skills in occupational contexts to close competency gaps and evaluate the long-term impact of these reforms.

5 CONCLUSION AND RECOMMENDATIONS

This study surveyed the basic abilities of senior students at Guangxi Police College, concentrating on six significant areas: moral awareness, social responsibility, cultural knowledge, critical thinking, aesthetic appreciation, and linguistic ability. Using a quantitative approach and a Likert 5-Point Scale questionnaire, the study provides significant insights into students' competencies and identifies areas for development. The findings show that students have a good foundation in essential skills, as seen by their

average rating of 3.38 (SD = 0.96). Moral awareness was significantly high, with a mean of 4.05 (S.D. = .93), particularly in applying ethical concepts in real-world circumstances (mean = 4.09), emphasizing moral and ethical instruction. Social responsibility earned high scores, with a mean of 4.03 (SD = 0.99), particularly for internships and community involvement (mean = 4.10). It validates the role of social responsibility in career advancement and organizational success. Cultural understanding received a mean score of 3.99 (SD = 0.97), with the highest ranking for understanding cultural implications on behaviours (mean = 4.06). It demonstrates the significance of cultural literacy in vocational education. The study discovered that Guangxi Police College students excel in moral awareness, social responsibility, cultural knowledge, critical thinking, and artistic appreciation but must enhance their language skills. Reforms suggest modifying the curriculum to improve language proficiency, practical training, and vocational program alignment with industry needs. These adjustments will better prepare students to face professional challenges and ensure they have a diverse skill set for future success.

Various recommendations are proposed to enhance fundamental competencies at Guangxi Police Colleges. For moral awareness, continue to weave ethical ideas throughout the curriculum and give regular workshops on ethical quandaries while assisting faculty with ongoing professional development. Regarding social responsibility, various community engagement pursuits through structured volunteer projects should be initiated. It is suggested that social responsibility be endorsed more extensively in academic curricula to encourage active citizenship. To enhance cultural awareness, provide exposure to global viewpoints through international case studies, and offer international internships and partnerships. To foster critical thinking, expand the curriculum with more case studies, problem-solving activities, and collaborative projects. Increase the number of arts-related subjects and interdisciplinary courses that combine art, technology, and vocational training to foster aesthetic appreciation. Finally, the medium level of language abilities can be managed by inculcating interactive and industry-specific language training programs in the curriculum to improve communication and employability.

5.1 Limitations and Further Studies

The study focuses exclusively on senior students at Guangxi Police College, thus limiting its ability to accurately represent the broader diversity of vocational student experiences across institutions and regions. The research is limited to a single cohort, which may ignore differences in skill levels across other vocational programs or educational contexts. Furthermore, the self-reported data to assess competencies such as moral awareness and critical thinking introduces possible biases, which may impair the accuracy and generalizability of the results. The study's environment is limited to a single school, which may not account for the different educational procedures and problems encountered by vocational students elsewhere and restrict the results' application to other contexts.

intended usage in the researchers' master's thesis and journal publication. An online questionnaire was implemented to acquire informed consent.

Competing Interests: The author(s) declared that this work has no competing interests.

Consent to Participate: As this study involves human subjects, collecting corresponding data about human rights issues is evaluated with informed consent.

Grant/Funding Information: The author(s) declared that no grants supported this work.

Data Availability Statement: N/A

Declaration Statement of Generative A.I.: This work's author(s) declared that they did not use any A.I. tools or program/software to draft this paper.

REFERENCES

Byoun, S., & Han, W. (2022). An analysis of Korean college students' needs for core competency education in universities. *The Korean Association of General Education*, *16*(3),101-116 https://doi.org/:10.46392/kjge.2022.16.3.101

Chang, J. C., Shih, H. F., & Yu, Y. H. (2023). Changing the perception of core competency using student journey–tracking research on the core competencies of EECS students in technological universities. *Education and Training*, *65*(8-9), 993-1005. https://doi.org/10.1108/ET-10-2022-0413

Chen, L. (2019). Research on the Cultivation of Teachers' Informatization Ability in Higher Vocational Colleges. In *Proceedings of the 2019 3rd International Conference on Education, Economics and Management Research (ICEEMR 2019) [Series: Advances in Social Science, Education and Humanities Research]*. Atlantis Press. https://doi.org/10.2991/assehr.k.191221.026

Chen, P., Goncharova, A., Li, J., & Frommberger, D. (2024). Competence-based approaches in curricula: A comparative analysis of Russian and Chinese commercial vocational education and training programmes. *Research in Comparative and International Education*, *19*(1), 63-90. https://doi.org/10.1177/17454999231219840

Deng, L., & Zhengmei, P. (2023). *Moral or skill priority: A comparative analysis of critical competencies frameworks in China and the United States (1st Edition)*. In Contextualizing Global Flows of Competency-Based Education (pp. 83-98). Routledge. https://doi.org/10.4324/9781003435242-6

Giselsson, K. (2020). Critical thinking and critical competencies: Mutually exclusive? *International Journal for the Scholarship of Teaching and Learning, 14(1)*, 1-9 https://doi.org/10.20429/ijsotl.2020.140105

He, Y. (2022). *Graduates' employability in the creative industry in China: What competencies, qualities, and skills Chinese graduates with an undergraduate degree in fine art need for employment in China* [Doctoral dissertation, University for the Creative Arts]. UCARO. https://research.uca.ac.uk/6258/

Hua, O., & Zeng, Q. (2019). The practical logic and curriculum construction of cultivating vocational core competencies under the guidance of outcome-oriented education concepts. *Vocational Education Forum, (06), 50-55*.

Hui, S. K. F., & Cheung, H. Y. (2015). Cultural literacy and student engagement: The case of technical and vocational education and training (TVET) in Hong Kong. *Journal of Further and Higher Education*, *39*(4), 553-578. https://doi.org/10.1080/0309877x.2014.938263

Jiang, H. (2024). Research the current status and development of secondary vocational information technology courses from the perspective of core subject literacy. *Bimonthly Journal of Multimedia and Network Teaching in China, 4(01), 78-81*.

Jones, M., & Brown, A. (2018). Developing critical thinking in vocational education: A case study approach. *Journal of Educational Development*, 23(1), 45-58.

Kong, J., & Sung, K. (2020). Analysis of cultural content and extent of reflection of core competencies in culture activities in secondary English textbooks. *Studies in English Education, 25*(3), 295-323. https://doi.org/10.22275/see.25.3.03

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30(3), 607-610.* https://doi.org/10.1177/001316447003000308

Kwon, M., & Kim, M. (2022). A Study on the effect of learning community activities on college students' core competencies. *The Korean Society of Culture and Convergence*. https://doi.org/10.33645/cnc.2022.7.44.7.189

Lin, C. (2017). Research on Chinese students' core competencies. *Studies of Psychology and Behavior, 2,* 145–154.

Li, H. (2024). *Reforming vocational education in China: Challenges and strategies*. Beijing University Press.

Liu, J. (2022). *Innovative teaching methods in vocational education: A case study*. *Journal of Vocational Education Research, 15*(3), 45-59.

Lu, X., Zhu, W., & Tsai, F. S. (2019). Social responsibility toward the employees and career development sustainability during manufacturing transformation in China. *Sustainability*, *11*(17), 1-17. https://doi.org/10.3390/su11174778

Lv, S., Chen, C., Zheng, W., & Zhu, Y. (2022). The relationship between study engagement and critical thinking among higher vocational college students in China: A longitudinal study. *Psychology Research and Behavior Management*, *15,* 2989-3002. https://doi.org/10.2147/PRBM.S386780

Ma, K. (2020). Teaching strategies for cultivating students' core academic competencies in secondary vocational schools: An example of information technology courses. *China Vocational and Technical Education, (20), 9-12*.

Ministry of Education of China. (2020). *Quality improvement and excellence action plan for vocational education (2020—2023)*.

Gao, J. (2006). *Opinions on implementing the national demonstration project for higher vocational colleges and accelerating the reform and development of higher vocational education* [MOE Publication No. 14]. Ministry of Education, Ministry of Finance. http://www.moe.gov.cn/srcsite/A07/moe_737/s3876_qt/200611/t20061103_109728.html

Nita, R., Wulanditya, P., & Dewi, N. (2022). Moderation of moral identity in ethical judgement and moral intention accounting students. *Journal of Governance, Taxation and Auditing, 2*(1),33-41. https://doi.org/10.38142/jogta.v2i1.716

Park, E. (2022). Examining EFL preservice teachers' development of core competencies through technology-enhanced language learning. *Journal of Language Teaching and Research, 13*(4), 697-706. https://doi.org/10.17507/jltr.1304.02

Park, K., Kim, H., & Kim, S. (2022). Factors influencing nursing core competency in nursing students. *Korean Society of Nursing Research*. https://doi.org/10.34089/jknr.2022.6.3.91

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review, 68, 275-292*.

Qiu, L. (2024). Research on intelligent teaching of higher vocational English oriented by core literacy. *Journal of Yangling Vocational and Technical College, 5(01), 99-102+112*.

Rodzalan, S., Noor, N., Arif, L., & Saat, M. (2020). Factors influencing improving students' critical thinking and problem-solving skills: An industrial training intervention. *International Journal of Emerging Technologies in Learning, 15*(22)*, 134-145.* https://doi.org/10.3991/ijet.v15i22.16303

Shi, H., Tian, M., & Xu, C. (2021). Research on blended learning design and application in vocational education based on core competency cultivation. *Vocational and Technical Education, 42(14), 36-40*.

Smith, J., & Lee, A. (2020). Enhancing core competencies in vocational education. *Journal of Vocational Training*, 15(4), 234-245.

Spekkink, A., & Jacobs, G. (2020). The development of moral sensitivity of nursing students: A scoping review. *Nursing Ethics, 28*(5)*,* 791 - 808. https://doi.org/10.1177/0969733020972450

Wang, L., Li, Y., & Fang, M. (2022). Aesthetic education curriculum construction and innovation in the new engineering education: An example of teaching an art appreciation aesthetics education course. In *2022 International Conference on Science Education, Culture and Social Development (ICSECSD 2022），* Vol.1(1), (pp. 369-372). Advances in Education, Humanities and Social Science Research. https://doi.org/10.56028/aehssr.1.1.369

Wang, Q., & Chen, Y. (2023). Core competencies in vocational training: Assessing effectiveness at Guangxi police college. *International Journal of Educational Development, 42*, 112-127.

Wang, Q., & Luo, S. (2019). *Shifting from teaching the subject to developing core competencies through the subject: The revised senior middle school English curriculum standards (2017 edition) in China*. In X. Gao (Ed.), Second Handbook of English Language Teaching [SIHE Series] (pp. 109-134). Springer, Cham. https://doi.org/10.1007/978-3-030-02899-2_6

Wang, Y., Xue, C., & Hua, T. (2021). University student core competencies－China＇s experience. *International Journal of Education*, *13*(3), 64. https://doi.org/10.5296/ije.v13i3.19057

Wevers, H., & Voinea, C. (2021). Corporate social responsibility as a core competence for the business model of social start-ups in the Netherlands. *European Journal of Sustainable Development, 10*(1)*,* 23-41. https://doi.org/10.14207/ejsd.2021.v10n1p23

Wilson, A., & Bishop, D. (2021). A novel online assessment of pragmatic and core language skills: An attempt to tease apart language domains in children. *Journal of Child Language, 49,* 38-59. https://doi.org/10.1017/S0305000920000690

Xiao, Z. R. (2021). The cultivation requirements and paths of core Competencies for higher vocational students from the perspective of vocational development. *Education and Vocation,* (16), 73-78.

Xie, X. (2019). The influence of professional commitment on vocational core Competencies of higher vocational students: The mediating effect of learning engagement. *Chinese Vocational and Technical Education,* (22), 83-87.

Xie, X., Yu, Y., & Wang, W. (2023). Impact of vocational core competencies of higher vocational students on innovative behaviour: The mediating effect of creative self-efficacy and the moderating effect of core self-evaluation. *Sage Open*, *13*(3). https://doi.org/10.1177/21582440231196661

Yuan, Z., Yang, L., & Zhang, Q. (2023). Values and strategies of aesthetic education in physical education under the goal of core competencies. *Frontiers in Sport Research*, *5*(7), 31-36. https://doi.org/10.25236/fsr.2023.050706

Zhang, M. (2023). Evaluating the integration of core competencies in vocational education programs. *Vocational Education Review, 18*(2), 23-37.

Zhang, Y., Wang, M., & Liu, H. (2019). Bridging gaps in police training programs: A focus on core competencies. *International Journal of Police Studies*, 12(3), 78-92.

Zhao, K. (2020). Educating for wholeness, but beyond competencies: Challenges to key-competences-based education in China. *ECNU Review of Education*, *3*(3), 470-487. https://doi.org/10.1177/2096531120935463

Exploring the Relationship between Student Engagement and Role of Career Adaptability to Enhance Employability of University Graduates

Zhiqiang Jiang[1], Baihong Chen[2], Ruibin Gao[3*]

[1,3]Faculty of Educational Administration Southeast Asia University, Bangkok, 10700, Thailand

[2]Faculty of Business Management, Shanxi Agricultural University, Jinzhong, 030801, China

Article Information	ABSTRACT
    Corresponding Author: **Ruibin Gao** 45326292@qq.com https://orcid.org/0009-0003-2272-4093	This study investigates the relationship between student engagement, career adaptability, and the employability of university graduates. Utilizing a quantitative research design, data were collected from 450 undergraduate and postgraduate students at two universities in Guangzhou, China. Regression analysis was conducted, and statistical package of social science (SPSS) software was employed to examine the impact of key variables, including career adaptability, transferable skills, social support networks, and student engagement, on employability outcomes. The results indicate a significant positive relationship between career adaptability and successful workforce transition, suggesting that graduates with higher adaptability are better prepared for the job market. Transferable skills gained through higher education were also found to have a substantial impact on employability across various industries. Furthermore, social support networks, both within and outside the university, were shown to positively influence graduates' career development and job acquisition. The findings underscore the importance of integrating career adaptability training in universities by emphasizing the development of transferable skills and strengthening social support networks. Additionally, fostering student engagement through academic and extracurricular activities is crucial. The study concludes that a comprehensive approach that incorporates these elements can significantly enhance the employability of university graduates, enabling them to meet the demands of the modern workforce. **Keywords:** Employability; University Graduates; Career Adaptability; Transferable Skills Social Support; Student Engagement

1. INTRODUCTION

Policymakers, schools, and employers are increasingly concerned about the employment rate of university graduates in the current and future international dynamic economy (Guo et al., 2014; Zhang et al., 2021). Career options for university graduates involve four major components, which include career adaptability, transferable skills, social support, and student engagement (Khoso et al., 2022). One of the components, career adaptability, caters to an approach with goal commitments, problem-related coping, and behavioral flexibility, or a client's readiness and ability to manage change (Coates, 2007). Rudolph et al. (2017), demonstrated that students with high career adaptability levels find jobs more readily and progress within their career paths more successfully.

Career adaptability is a significant predictor of employability, suggesting a significant relationship between career adaptability and university graduates' achievement of satisfactory entry-level positions. At the same time, it is important not to underestimate the value of transferable skills those universally applicable abilities that are useful across different roles and fields. The current employment world has deemed desirable social skills such as communication skills, problem solving, teamwork, and computer skills (Panigrahi et al., 2018). Jackson & Tomlinson (2020) pointed out that the acquisition of soft skills during higher education is helpful in improving the employability of the graduates.

Furthermore, a number of factors, including internal and external social support structures, are significant in shaping graduate outcomes in terms of career buildup and employment. These networks are social assets that can offer emotional, informational, and instrumental support necessary for career advancement and career prospects (Bouchrika et al., 2019). In a university setting, the role of faculty, career services, and peers is critical in preparing students for career placements and job search activities. Faculty, career service centres, and peers all play significant roles in enhancing students' readiness for these endeavours (Baluku et al., 2021). As a result, family and friends play a critical role in building graduates' morale and encouraging them to consider possible career paths. In addition to this, other external factors, such as professional mentors and other role models who have graduated and are already in the workforce, boost graduates' employment prospects by giving them recommendations and chances to advance in their career (Green et al., 2020).

Jackson and Tomlinson (2020) postulate that academically engaged students are more productive, possess relevant competency, and have better job search practices than their counterparts. Scholars widely understand that student engagement enhances the likelihood of transitioning from university to the workforce, with previous research demonstrating a direct correlation between engagement levels and employability. The integrated framework of employability relies heavily on factors such as career adaptability, transferable skills, length and support, engagement, and employability to ultimately improve graduate outcomes. Employability frameworks must include career adaptability, transferable skills, social and student support, and student engagement (Parola & Marcionetti, 2022).

However, with increasing higher education coverage and an expanding number of graduates joining the work force, a'mismatch' between the skills graduates possess and the skills employers seek remains a concern (Liu et al., 2020). Therefore, there are many issues that this research focuses on, namely the deficits in career adaptability, the absence of transferable skills, the shortage of social support requirements, and the concerns about the level of relationship with the students. Dealing with these factors necessitates an understanding of how they affect employability. According to research, career adaptability positively impacts career outcomes and enhances personnel's employability by enhancing their capacity to handle change and workplace demands (Magnano et al., 2021).

Previous studies have analysed these elements in isolation, disregarding the intertwining and cumulative outcomes that they have on employability (Lee et al., 2021; Ma et al., 2021; Rivera et al., 2021). Given this research gap, the study will adopt a comprehensive approach to the analysis of these factors, aiming to bridge this gap in the literature and provide insight into how these various factors interact and influence graduate outcomes. This integration is crucial in enhancing teaching and learning practices as well as policies that are relevant to the present-day competitive job market (Monteiro et al., 2020). These changes necessitate redefining dimensions of employability in order to prepare graduates for work.

We seek this re-orientation to inspire relevant skills and attitudes in the graduates for the complex world of work (Zhong et al., 2021). This enlightenment came from an understanding of the rising difficulty that university graduates encounter in the job market. The competitive economic world affects their employment opportunities. While the number of universities and colleges has significantly increased, allowing for higher enrolment and graduation rates, graduates find it difficult to move from the classroom to the workplace, thus questioning the efficiency of conventional learning models. This research is unique for its multifaceted view of career adaptability, transferable skills, social support, and student engagement, and how they impact employability. This work, therefore, contributes to the current literature by examining the influence of these variables among graduates from two universities in Guangzhou, a fast-growing city in China.

This research makes a theoretical contribution by realizing that the aspects of employability are indeed interrelated in a complex manner, and the practical implication of this knowledge may be beneficial for universities and policymakers in order to enhance students' employability prospects. In the context of career construction theory, the aspect of career adaptability has received significant attention, with direction, control, curiosity, and confidence emerging as pivotal adaptability resources in career development (Hamzah et al., 2021). Social capital theory anchors the function of social support, asserting that individuals possess certain relational assets that enable them to access societal resources and opportunities (Zhang et al., 2021). Shenoy et al. (2020) utilized the social capital theory to capture a graduated employability process and map out how internal and external ties facilitate career outcomes.

2. LITERATURE REVIEW

2.1 Students Engagement and Career Adaptability

Career adaptability is an essential concept for understanding how young people cope with the current intimidating and competitive world of work. Career adaptability, defined as the ability and preparedness to tackle current and anticipated career development challenges, changes, and crises, is considered a crucial factor in determining career success (Chui et al., 2022). Researchers have extensively investigated the phenomenon of career adaptability, suggesting that individuals with high adaptability have more opportunities for career mobility, which in turn leads to improved career outcomes (Li et al., 2021). The literature in the field of career construction theory laid the foundation for characterizing career adaptability. Besides, this theory holds that the self-architecture constitutes an entity, making it expeditious to enter the profession voluntarily and proactively.

It creates a career out of current opportunities based on the self-concept, which changes with experience and contextual information processing. Career adaptability in this context encompasses four key dimensions: concern, control, curiosity, and confidence. We can view these as the major dimensions of adolescent concern. Altogether, these dimensions help the students to consider the potential future demands of the occupation (concern), to assume the primary accountability for their career trajectory (control), to examine possible selves and career paths (curiosity), and to advance towards the career objectives with confidence and efficiency (Kengatharan, 2020). Santilli et al. (2020a) provided significant evidence that career adaptability has a positive correlation with career satisfaction and perceived employability, which makes a lot of sense since individuals with higher extroverted career adaptability are more likely to have better career results. Various contexts and groups have explored the concept of career adaptability in describing and promoting the process of transitioning from education to employment.

Rasheed et al. (2020) established career adaptability as a way to positively predict career success among Swiss adolescents, which supports the multifarious applicability of this concept. Numerous studies have sought to explain how career transition impacts the various mechanisms of career optimism (Boo et al., 2021; Monteiro et al., 2020; Santilli et al., 2020b). One of the significant mechanisms is the increase in job-search-related behaviors. A study also shows career adaptability involves active job seeking behavior amongst the candidates, such as networking, resume writing, and interview practice (Ocampo et al., 2020). Scholars have also discussed how schools and career counseling teach career adaptability skills. Researchers have found that various educational programs, including internships, career activities, workshops, and mentoring systems, effectively enhance students' career adaptation competencies (Bartley & Chen et al., 2020).

Career counselling primarily focuses on these four distinct aspects of career adaptability, while also significantly enhancing students' readiness for the job market. Therefore, despite the clear relevance of career adaptability and its crucial role in defining a successful career transition, several questions remain unanswered. For instance, the globalized job market and the exploration of cross-cultural career adaptability are unexplored research topics that could lead to the development of universally effective methods (Zhang et al., 2023). Furthermore, qualitative designs that track graduates' career experiences and growth years after graduation could provide a more comprehensive understanding of the long-term impacts of career adaptability. Thus, the following hypothesis is postulated:

H1: There is a positive relationship between students' engagement and career adaptability.

2.2 Transferable Skills and Career Adaptability

As for the key competencies in the learning process, communication, problem solving, teamwork, and information technology competencies predict the different prospects for jobs and industries' challenges effectively (Liu et al., 2023). Research interest in the relationship between transferable skills and employment has been growing for a long time, indicating that transferable skills are undeniably capable of boosting university graduates' job prospects. It is imperative at this stage to define transferable skills, which are the skills that can be utilized in various employment settings and are not necessarily bound to a particular job or sector (Chen et al., 2020). We sometimes divide these skills into thinking skills, social skills, and information processing skills. Critical thinking and problem-solving skills. Relational skills encompass the ability to communicate effectively and collaborate effectively in a team. We also refer to technical skills, like computing skills, as transferable skills. The focus on transferable skills corresponds well with the trends in satisfying complex skill demands influenced by the fluidity of roles and organizational boundaries (Kengatharan, 2020).

Studies have established that the development of transferable skills during higher education has a direct impact on graduates' employability. Huang et al. (2022) conducted research among the Australian business graduates and identified that employers attract abilities like communication, teamwork, and problem solving. The study revealed that graduates possessing these skills were more likely to secure jobs and could advance in their roles. Kim and Shin (2020), for the same reason, studied the employability of graduates in the UK and Europe and discovered that transferable skills emerged as key predictors of career outcomes, irrespective of occupational disciplines.

Jia et al. (2022) identify group projects, internships, and service-learning activities as the active learning strategies that can enhance these essential skills. These learning options provide students with invaluable exposure and the opportunity to apply the acquired knowledge. For instance, group projects help to encourage teamwork and develop communication skills, while internships provide students with practice in the professional environment and the ability to strengthen their competencies (Abid et al., 2021; Kaushik & Agrawal, 2021).

H2: Transferable skills have a significant impact on career adaptability.

2.3 Social Support and Career Adaptability

It is crucial for university graduates to have strong social support networks that enable them to achieve favourable career outcomes in their employment prospects. Social support networks such as family and friends, organizational mentors, and other professional associations offer affective, informative, and functional support, which can greatly predict one's career trajectory (Delle & Searle, 2022). The curriculum emphasizes the importance of social support networks, especially their impact on career development processes, including job search approaches, career choices, and career advancement (Collie et al., 2020). Therefore, graduates who effectively utilize their social networks have a higher chance of landing a job or receiving a promotion within a specific timeframe (Tani et al., 2021). Within the university context, we can consider interactions with faculty, fellow students, and career centers as forms of social support (Xu et al., 2020).

Career and job seekers benefit from the support from their families and friends because they are people who will encourage them and offer them a hand when searching for a job (Benlahcene et al., 2021). Senior employee mentors can offer valuable organizational information and expertise to their mentees, while professional mentors can offer advice based on practice environments, contacts, and networks, all of which are crucial for career advancement to the next level. According to Liu et al. (2023), graduates who had access to a mentor were more likely to secure employment and receive better promotions than those who did not.

This development is important because succession and career planning ensure adequate preparation, as well as offer knowledge and guidance that can lead to better career prospects (Veluvali & Surisetti, 2022). Job seekers who invest time in building their social support networks are more likely to actively seek jobs, secure employment offers, and secure employment. According to the findings of Adipat et al. (2021), for a senior job seeker, social support helps minimize the stress associated with job search and increases the seeker's motivation, thereby enriching their job search strategies (Tani et al., 2021). Cross-sectional research supports this idea by showing a positive correlation between career success, consistent employment outcomes, and social support systems, particularly when individuals receive support over an extended period of time (Abid et al., 2021).

H3: Social support networks, both within and outside of the university, positively impact graduates' career adaptability.

2.4 Career Adaptability and Employability Outcomes

Student engagement is simply defined as learners' participation and attachment to their learning processes, as one of the key factors that can significantly affect students' employability perspectives (Chen et al., 2020).

A correlation between increased levels of student engagement and improvements in academic achievement, job market preparedness, and more efficient job searching skills increase employability (Khoso et al., 2024). In the same year, learners' engagement in activities within and outside the classroom had a significant impact on academic performance. This validates the idea that engagement fosters a favorable learning environment, which in turn enhances performance. Financially engaged students are happier and more involved, and as a result, they enhance employer-oriented features like interpersonal, cooperation, and creative skills (Kengatharan, 2020). For students, participating in group assignments, internships, and organizational leadership positions exposes them to nurture their personal career characteristics, making them actually career-ready (Kaushik & Agrawal, 2021).

The connection between students' engagement and employability outcomes is undeniable. According to a study by the National Survey of Student Engagement (NSSE), students who are more engaged in class, academic, co-curricular, social, or organizational activities are more likely to do well and are perceived to have higher levels of career readiness (Xia et al., 2020). A memorandum of understanding between academic performance/career readiness and job search strategies confirms that student engagement enhances job search strategies. Engaged students are more likely to actively seek employment and utilize a variety of strategies and sources to do so (Geraghty et al., 2020; Khoso et al., 2024).

In addition to the above research on job search self-efficacy, other studies examining the subject also endorse the correlation between student engagement and the aforementioned job search activities. Job searches self-efficacy, which refers to a person's confidence level in undertaking job search activities, is an important and fundamental factor that explains the job search behavior and the resulting job search outcomes (Carvalho & Mourão, 2021). Besides, students essentially demonstrate an implication of student engagement related to the long-term implications of their career satisfaction. Engaged students develop their professional selves and gain direction in their choices, leading to career orientation and enhancing career stability and dexterity (Ma et al., 2023; Oliveira et al., 2023).

H4: Career adaptability enhances employability outcomes, including academic performance, career readiness, and job search strategies.

Figure 1 shows the research model for the present study, indicating an association among study variables. This study will employ a research model that emphasizes the variables of student engagement, transferable skills, social support, career adoptability, and employability cross-path. The model also assumes that the activity levels, generic self-attributes, and resources perceived by the students have a direct and positive relation to their career adaptability and thereby impact employment results.
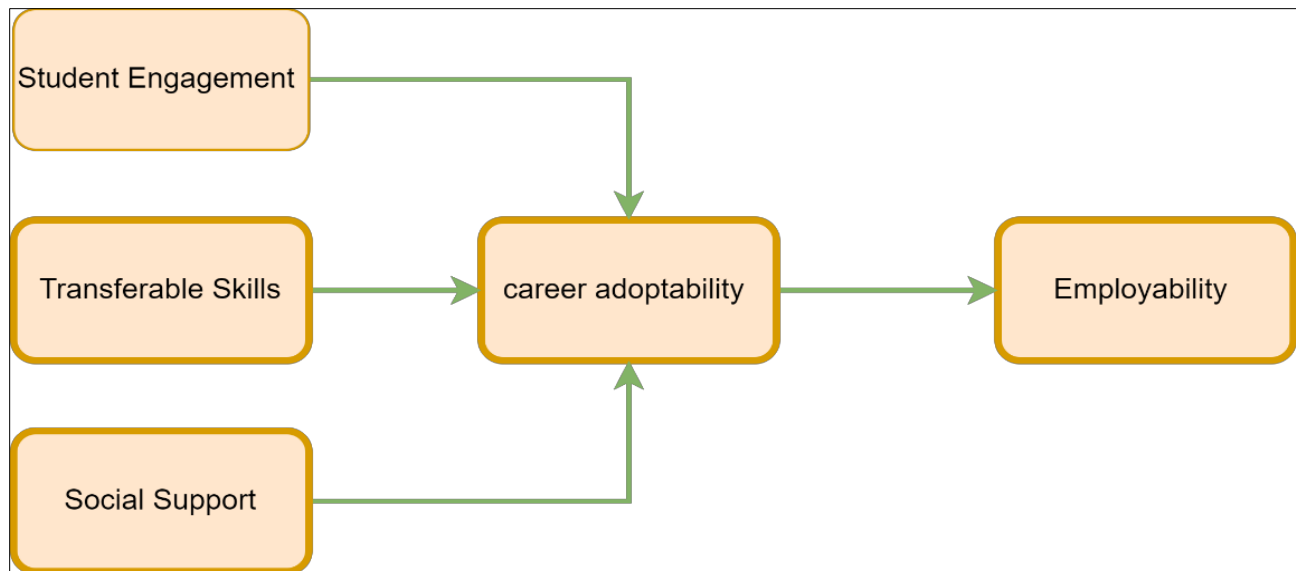
Figure 1. Research Model

3. METHODOLOGY

3.1 Research Design

This study employs a quantitative research design, specifically targeting the relationship between student engagement, career adaptability, transferable skills, social support networks, and employability outcomes among university graduates in Guangzhou, China. We utilized a cross-sectional survey design to collect data from 450 undergraduate and postgraduate students at two universities. A cross-sectional design allows for the examination of the current state of these variables and their interrelationships within this specific population at a single point in time.

We carefully designed the survey instrument to measure each variable using validated scales, ensuring the accuracy and reliability of the data. As it can be stated, student engagement was measured using the student engagement scale, career adaptability was assessed through the career adaptability scale (CAAS), transferable skills were evaluated using a standardized employability skills assessment, and social support networks were gauged through a social support scale. We measured employability outcomes by assessing academic performance, career readiness, and job search strategies among the participants.

3.2 Sample and Data Collection

This study involved a quantitative research design, focusing on both undergraduate and postgraduate students (N = 450) from two universities located in Guangzhou, China. Institution 1 was a smaller university with a strong emphasis on undergraduate education (N = 310), while Institution 2 was a research-intensive university (N = 140). The decision to draw samples from Guangzhou was based on the city's prominent role in China's higher education system and its diverse student population, which mirrors the complexity and dynamism of the broader educational landscape in China (Boo et al., 2021). The sample is representative of the universities' populations, with a fairly balanced proportion of male and female students, the majority of whom are aged less than 30 years. Additionally, approximately one-quarter of the participants were international students.

The study precisely designed an online survey to collect data on key variables such as job preparedness, portfolio development, social support systems, and student involvement. WeChat, a widely used messaging and social media platform in China, conducted the survey, facilitating the detailed collection of quantitative data. This approach helped illustrate how these variables impact the employment outcomes of university graduates. The decision to use WeChat enabled the gathering of data from a wide cross-section of participants, regardless of their location, ensuring an adequate and diverse sample for analysis.

3.3 Instrument Design & Measurement

We carefully selected the measures in this study to ensure the validity and reliability of the constructs under examination. It is linked to parameters such as student engagement, readiness for career change, transferable employability skills, and perceived social support. We derived all the relevant scales mentioned in the previous section from internationally recognized sources in the literature. Essentially, we used Dogan's (2015) scale to assess students' engagement. This scale belongs to the category of the global indexes of student engagement and addresses behavioral, emotional, and cognitive aspects. It is a self-report measure consisting of numerous items operationally defined on a Likert scale, such that the higher the score, the higher the level of engagement. Previous research works have established the reliability and validity of this scale, making it convenient to measure engagement in this research. On the other hand, Maggiori et al. (2017) developed the Career Adaptability Scale (CAAS) to measure career adaptability.

The CAAS measures four dimensions of career adaptability: concern, control, curiosity, and confidence. In other words, the Likert type items' scores operationalize the construct of each dimension. Studies on career development commonly use this scale due to its established psychometric features. It is able to capture the adaptability resources that people employ in order to undertake and address career-related demands and issues. In addition, the participants' transferable skills were assessed using the scale adapted from Alpay and Walsh (2008). It measures some of the general transferable skills, including interpersonal and communication skills, teamwork and collaboration skills, problem-solving skills, and critical thinking skills. Participants self-assessed their level of skill from 1 ('not at all') to 5 ('very well'). Given that it aims to determine skills that are transferable across various vocational fields, this measure is particularly useful for assessing employability skills. Finally, Sarason et al. (1983) designed the Social Support Questionnaire (SSQ), which the students completed to assess social support. The SSQ consists of multiple items rated on a Likert scale, capturing both the quantity and quality of social support. The established scale from the literature, as shown in Table 1, demonstrates strong reliability and validity.

Table 1. Measurements of Study

Construct	Scale	Source	Dimensions	Cronbach's Alpha
Student Engagement	Student Engagement Scale	Dogan (2015)	Behavioral, Emotional, Cognitive	0.89
Career Adaptability	Career Adapt-Ability Scale (CAAS)	Maggiori et al. (2017)	Concern, Control, Curiosity, Confidence	0.92
Transferable Skills	Transferable Skills Scale	Alpay and Walsh (2008)	Communication, Teamwork, Problem-Solving, Critical Thinking	0.87
Social Support	Social Support Questionnaire (SSQ)	Sarason et al. (1983)	Quantity, Quality of Support from Family, Friends, Others	0.91

3.4 Ethical Considerations

This study adhered to ethical considerations, given its involvement with human participants. The author's obtained the approval from the Institutional Review Boards (IRBs) of the two universities in Guangzhou prior to data collection. The IRBs reviewed and approved the research objectives, methodology, data collection instruments, and measures to ensure participants' anonymity and informed consent. We provided the participants with an information consent form that detailed the study objectives, activities, benefits, and risks, along with the voluntary nature of their participation. Before the actual survey, we offered the participants a checkbox option to electronically confirm their consent.

To protect the subjects, the data collection did not include student names or student identification numbers. All the data was collected through an online questionnaire, which was administered through a secure webpage with an encrypted data connection. Furthermore, the database stored all collected material in password-restricted files, limiting access to only the project's members. We have taken care to adhere to the principle of beneficence, minimizing risks and maximizing the study's benefits. The university also provided participants with contact details for counselling services at the end of the questionnaire.

3.5 Data Analysis Techniques

We conducted data analysis for this study using regression analysis in SPSS (Statistical Package for the Social Sciences) to examine the relationships among variables such as student engagement, career adaptability, transferable skills, social support, and employability outcomes. We first screened the dataset for missing values, outliers, and inconsistencies. We handled missing data using mean substitution or imputation techniques, and addressed outliers based on z-scores. We calculated descriptive statistics such as means, standard deviations, and frequency distributions to summarize the demographic data and study variables. We assessed the internal consistency of the survey instruments using Cronbach's alpha, with values above 0.70 indicating acceptable reliability. Exploratory factor analysis (EFA) confirmed the construct validity. We employed multiple regression analysis to test the research hypotheses, assessing the impact of student engagement and career adaptability on employability outcomes.

We included control variables like age, gender, academic discipline, and university type to ensure the accuracy of the models. We tested and met the assumptions of regression analysis, which include linearity, independence of errors, homoscedasticity, normality, and multicollinearity. We evaluated the regression models using R-squared and adjusted R-squared to determine the proportion of variance in employability outcomes that the independent variables explained. The F-test confirmed the overall significance of the models, while the coefficients shed light on the direction and strength of relationships among the variables.

4. RESULT AND DISCUSSION

Table 2 shows that the study sample consisted of 450 participants, with a fairly balanced gender distribution (49.33% male and 50.67% female). The majority of participants were under 30 years of age (80.89%), and most were undergraduate students (75.56%). Additionally, a significant portion of the sample were domestic students (75.11%).

Table 2. Demographic Characteristics of the Study Sample (N=450)

Demographic Variable	Institution 1 (N=310)	Institution 2 (N=140)	Total (N=450)	Percentage
Gender				
Male	180	42	222	49.33
Female	130	98	228	50.67
Age				
< 30 years	248	116	364	80.89
≥ 30 years	62	24	86	19.11
Student Status				
Undergraduate	250	90	340	75.56
Postgraduate	60	50	110	24.44
Nationality				
Domestic	233	105	338	75.11
International	77	35	112	24.89
Academic Discipline				
Social Sciences	145	65	210	46.67
Other Disciplines	165	75	240	53.33

Figure 2 illustrates the demographic characteristics of the study sample, displaying the distribution of participants by gender and age across the total sample of two institutions. The figure shows the number of male and female students, as well as the age groups under 30 years and 30 years or older, providing a visual representation of the sample's demographic composition.
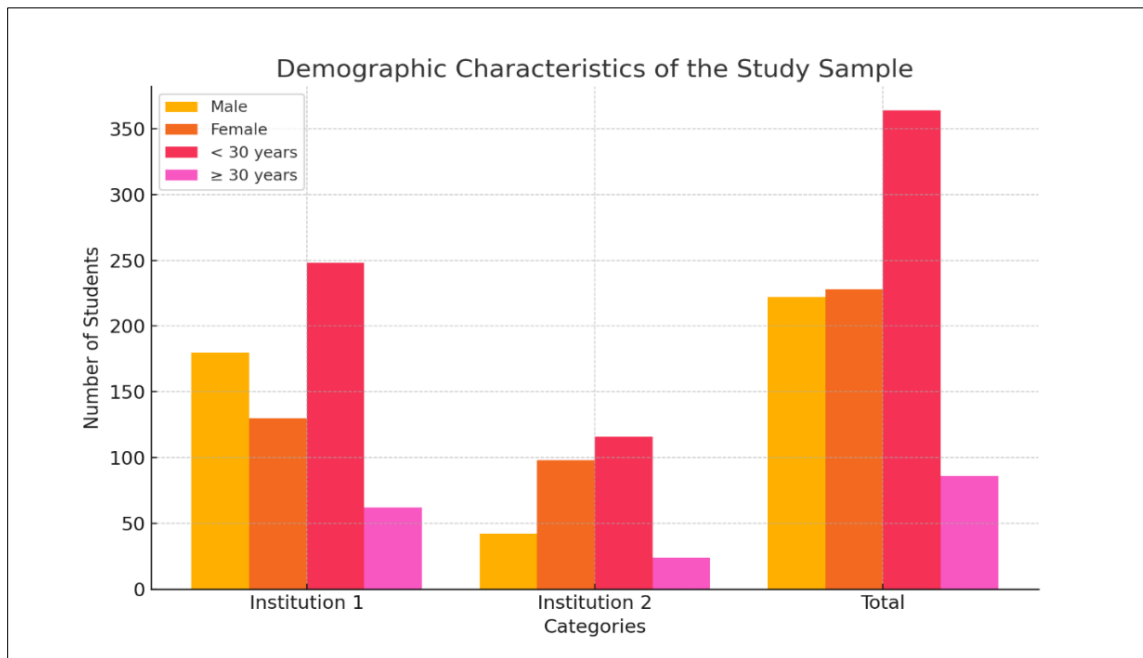
Figure 2. Demographic Characteristics of the Study Sample

Figure 3 shows the academic and nationality distribution of the study sample across the two institutions. The figure highlights the number of undergraduate and postgraduate students, as well as the distinction between domestic and international students. It is evident from the figure that Institution 1 has a higher proportion of undergraduate students and domestic participants, whereas Institution 2 has a more balanced distribution of postgraduate and international students.
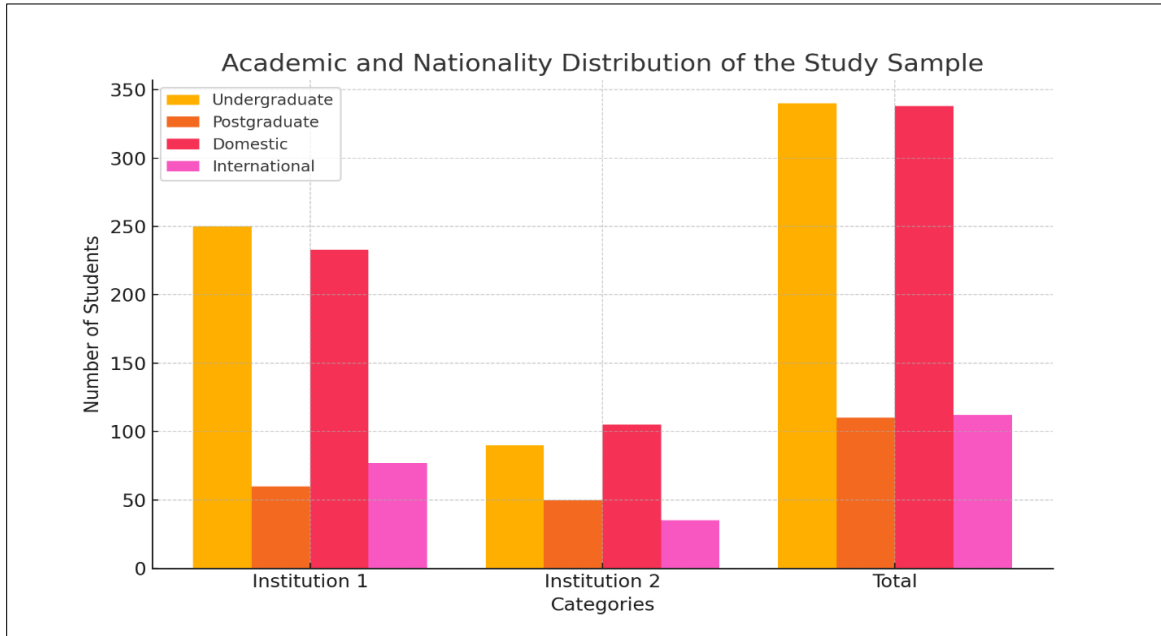
Figure 3. Academic and Nationality Distribution of the Study Sample

Table 3, below provides insight into the overall trends and variability within the study sample. The data shows that participants generally reported positive levels of career adaptability, transferable skills, social support, student engagement, and employability.

Table 3. Descriptive Statistics of Key Variables (N=450)

Variable	Mean	Standard Deviation
Career Adaptability	4.16	0.83
Transferable Skills	4.02	0.74
Social Support Networks	3.86	0.89
Student Engagement	4.17	0.8
Employability	4.1	0.85

Table 3, indicate the central tendency and variability within the sample. The mean scores for all variables range between 3.86 and 4.17 on the Likert scale, suggesting that participants generally rated themselves positively on career adaptability (Mean = 4.16, SD = 0.83), and transferable skills (Mean = 4.02, SD = 0.74). The social support networks have a mean of 3. 86, and the standard deviation was recorded to be 0. 89 with minimum and maximum values of 1. 19 to 6. 12 respectively. The data represents moderate to high level of career adaptability, transferable abilities, social support, students' activity, and prospects of employment among the participants, with some fluctuation in each aspect.

Table 4 discusses the reliability of the scales used in this study, with Cronbach's Alpha values ranging from 0.82 to 0.88 for all key variables. These values indicate good internal consistency, confirming that the instruments used to measure career adaptability, transferable skills, social support networks, student engagement, and employability are reliable and suitable for the analysis.

Table 4. Reliability Analysis (Cronbach's Alpha)

Scale	Cronbach's Alpha
Career Adaptability	0.85
Transferable Skills	0.88
Social Support Networks	0.82
Student Engagement	0.87
Employability	0.86

The Cronbach's alpha for career adaptability is 0.85, indicating high reliability. With a Cronbach's alpha of 0.88, more refined reliability levels are emerging from the transferable skills. Physiological assessment quantifies social support networks, revealing good reliability with a Cronbach's alpha of 0.82. The Cronbach's alpha score of 0.87 indicates that student engagement also exhibits reasonable internal consistency. Lastly, the employability scale exhibited a reliability score of 0.86, indicating that the scale designed to measure this variable has good reliability. All in all, these values provide evidence that the scales used in this study are tapping into the expected constructs.

Moreover, Table 5 provides the results of the exploratory factor analysis (EFA), showing strong factor loadings (ranging from 0.71 to 0.83) for each variable. The explained variance for the factors ranges from 21% to 25%, indicating that the items effectively represent their respective constructs and support the validity of the measures used in the study.

Table 5. Exploratory Factor Analysis (EFA)

Variable	Representative Items	Factor Loadings	Explanation of Variance
Career Adaptability	Items 1-12	0.73 - 0.83	25%
Transferable Skills	Items 1-33	0.71 - 0.79	22%
Social Support Networks	Items 1-40	0.75 - 0.83	24%
Student Engagement	Items 1-31	0.74 - 0.83	23%
Employability	Items 1-15	0.72 - 0.81	21%

The results of the exploratory factor analysis (EFA) reveal that the 12 items that form career adaptability have factor loads ranging from 0.73 to 0.83. A majority of transferable skills displayed 33 items, with factor loading ranging from 0.71 to 0.79. It had the second-lowest factor loading of 0.79 and accounted for 22% of the total variance on the axis. Hypothesis 1 proposed that the 40-item social support networks would display factor loadings between 0.75 and 0.83, with the study's incorporated variables accounting for 24% of this variance. The table displays the factor loadings for student engagement, which span 31 items and range from 0.74 to 0.83.

This means that it explains 23% of the variance, ranking 83rd out of all nations. Regarding the findings derived from the H-interview and validity test, the factor analysis of employability demonstrated 15 items and factor loadings ranging from 0.72 and 0.81, which account for 21% of variance. These findings suggest that the items of each variable are well-defined in their corresponding factors, and, cohesively, these factors have a significant ability to account for the variability within the data.

Figure 4 illustrates the eigenvalues for each factor extracted during the exploratory factor analysis (EFA). Each point here corresponds to a specific factor for which it holds the eigenvalue, and the factors are in diminishing order of eigenvalues. This plot serves to determine the number of factors to retain by indicating where the eigenvalues become flat to underscore the level beyond which including more factors would not add much to the variance or data explained.
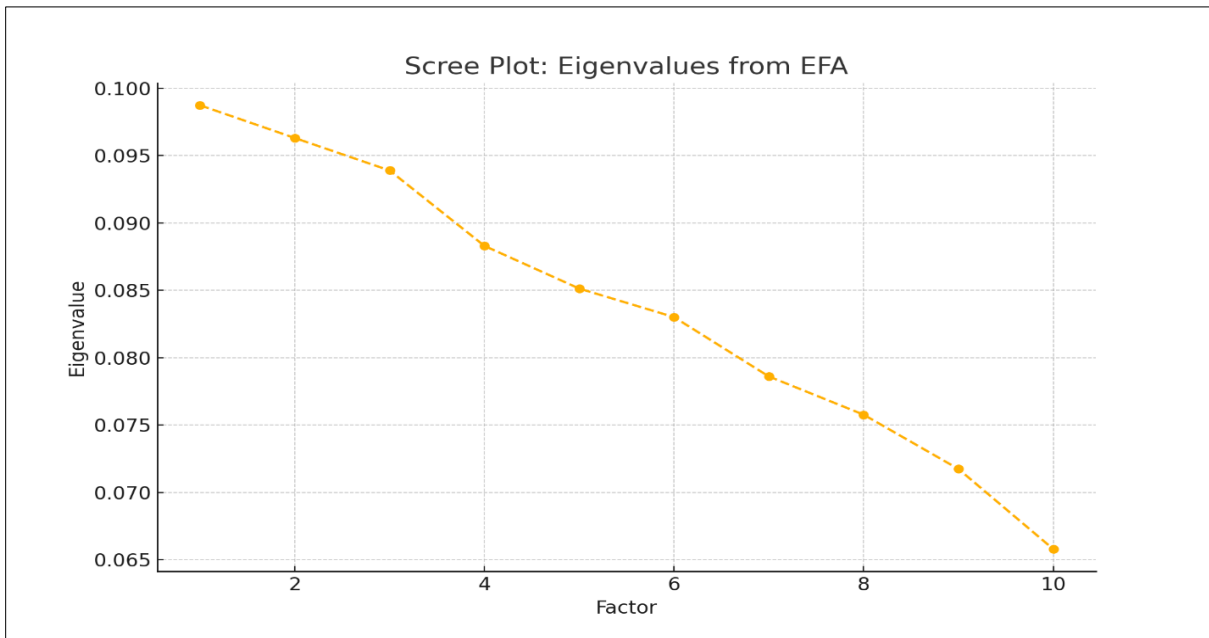
Figure 4. Scree Plot - Eigenvalues from Exploratory Factor Analysis (EFA)

Similarly, Figure 5 below demonstrates the percentage of the accumulated variance contributed by each factor derived from the Exploratory Factor Analysis (EFA). Every single bar corresponds to the explained variance for particular factor in concern. It will identify the proportionate contribution of each concerned factor towards total variance occurred in the respective data set. It can be used to gain insight as to the importance of each factor and to determine how many factors should be retained by assessing their explanatory properties.
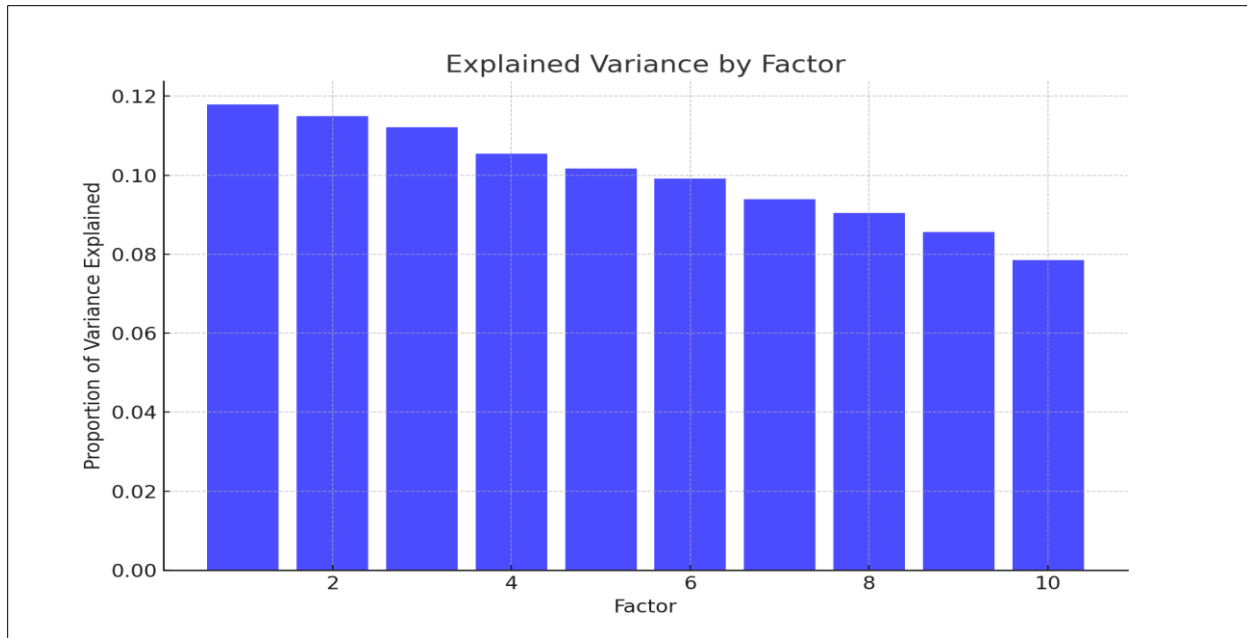
Figure 5. Explained Variance by Factor

Table 6 presents the results of the regression analysis, which supports all the study's hypotheses with significant p-values ($p < 0.001$). The analysis shows that student engagement, transferable skills, and social support positively influence career adaptability, while career adaptability, academic performance, career readiness, and job search strategies significantly impact employability. The model explains 68% of the variance in employability outcomes, as indicated by the R-squared value. It can be observed that table 6 discusses the regression analysis results which support the hypotheses by demonstrating significant relationships between the variables. The model explains 68% of the variability in Employability ($R^2 = 0.68$), with an adjusted R^2 of 0.67 and an F-statistic of 90.53 ($p < 0.001$), indicating a good fit for the data.

Table 6: Regression Analysis

Hypothesis	Dependent Variable	Independent Variable	Coefficient	Standard Error	t-value	p-value	Confidence Interval (95%)
H1	Career Adaptability	Student Engagement	0.4	0.07	5.71	<0.001	[0.26, 0.54]
H2	Career Adaptability	Transferable Skills	0.35	0.06	5.83	<0.001	[0.23, 0.47]
H3	Career Adaptability	Social Support	0.28	0.05	5.6	<0.001	[0.18, 0.38]
H4	Employability	Career Adaptability	0.45	0.08	5.62	<0.001	[0.29, 0.61]
	Employability	Academic Performance	0.25	0.07	3.57	<0.001	[0.11, 0.39]
	Employability	Career Readiness	0.3	0.06	5	<0.001	[0.18, 0.42]
	Employability	Job Search Strategies	0.33	0.07	4.71	<0.001	[0.19, 0.47]
R^2			0.68				
Adjusted R^2			0.67				
F-statistic			90.53			<0.001	

33

4.3 Assumption Testing for Regression Models

      Ensuring the underlying assumptions of the regression models, as presented in Table 6, is crucial for ensuring the validity and reliability of the results. We conducted several graphical analyses to this end. We used scatterplots to evaluate the linearity of the relationships between the independent and dependent variables, confirming that a straight line can accurately represent these relationships. We examined the residual plot to verify homoscedasticity, ensuring that the variance of the residuals remains constant across different levels of the independent variables, a crucial aspect for unbiased and consistent model predictions. We also analyzed the histogram of residuals and the Q-Q plot to evaluate the residuals' normality. Both plots indicated that the residuals are approximately normally distributed, supporting the assumption of normality, which is vital for valid hypothesis testing and confidence interval estimation. Together, these graphical analyses provide a robust validation of the regression models, addressing key assumptions that underpin the accuracy and reliability of the study's findings.

4.3.1 Scatterplots

      Figure 6 illustrates the scatterplot which shows the relationship between student engagement and employability outcomes. Each point represents an individual student's level of engagement and their corresponding employability outcome. The scatterplot helps visualize the linear relationship between these two variables, supporting the assumption of linearity for regression analysis.
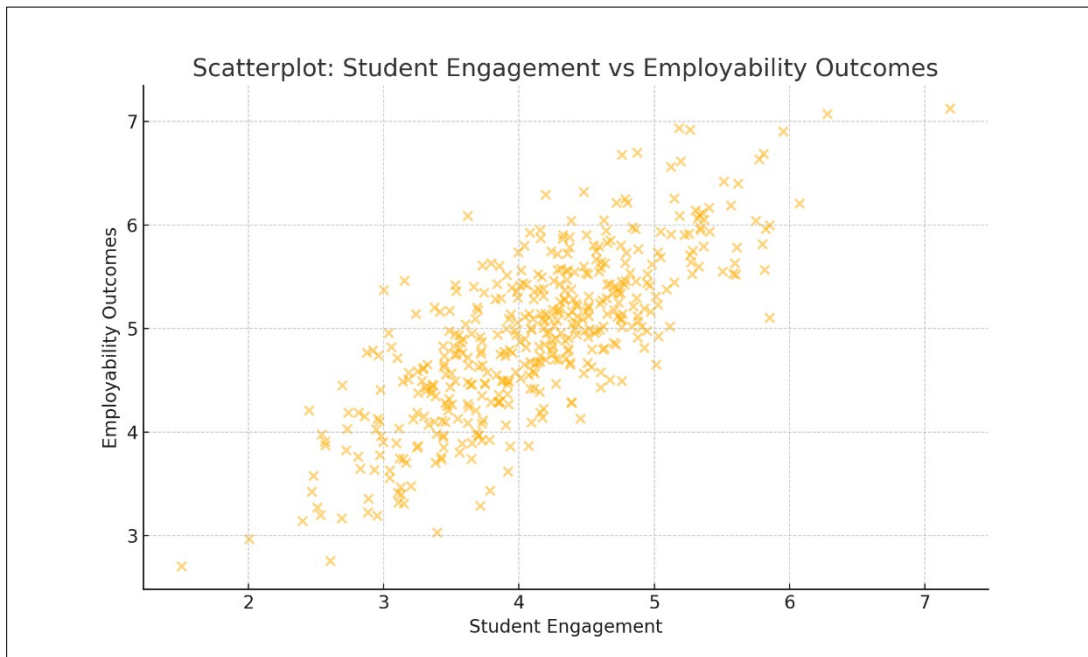
Figure 6. Scatterplot: Student Engagement vs Employability Outcomes

      Figure 7 shows a scatterplot depicting the relationship between career adaptability and employability outcomes. The positive trend observed in the scatterplot indicates that higher levels of career adaptability are associated with better employability outcomes, reinforcing the findings from the regression analysis.
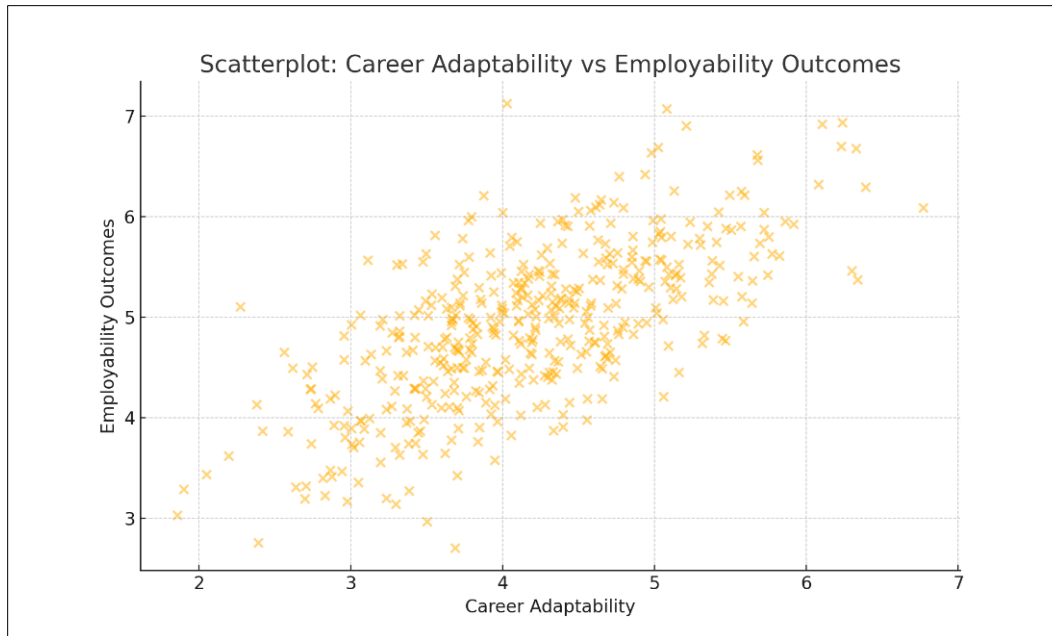
Figure 7. Scatterplot: Career Adaptability Vs Employability Outcomes

4.3.2 Residual Plot

The residual plot allows evaluation of the deviations from the expected pattern, bearing in mind that the values plotted in it are deviations from the regression line utilized in this study. This plot is employed to assess the assumption of homoscedasticity of the regression analysis, which is essential to guarantee the accuracy of our findings concerning student engagement, career adaptability, and possibilities to achieve employment. In figure 8, the test for homoscedasticity of the regression model is depicted by the residual plot. The scattering of the residuals randomly around the horizontal axis implies that the assumption of homoscedasticity is fulfilled meaning that the level of variance is constant at any level of the fitted values. This enhances the reliability and accuracy of the regression analysis that has been done in this study.

4.3.3 Histogram of Residuals

Histogram of residuals is used to determine adherence to normality in the context of the regression analysis. It is to be noted that a bell-shaped histogram indicates normality of the residuals, which is one of the assumptions of valid regression analysis. Checking the normality of the residuals guarantees that the model for the prediction of employability outcomes using the components of student engagement and career adaptability is accurate and free from systematic bias. Figure 9 below shows the histogram of residuals applied to test for normality assumption of the regression model. The residuals are said to be normally distributed and hence the normality assumption is reasonably met as reinforced by the figures above as well. This makes the findings of the regression analysis credible and affirms the accuracy of the results that has been obtained from the model.

Figure 8. Residual Plot: Checking Homoscedasticity in Regression Model

.
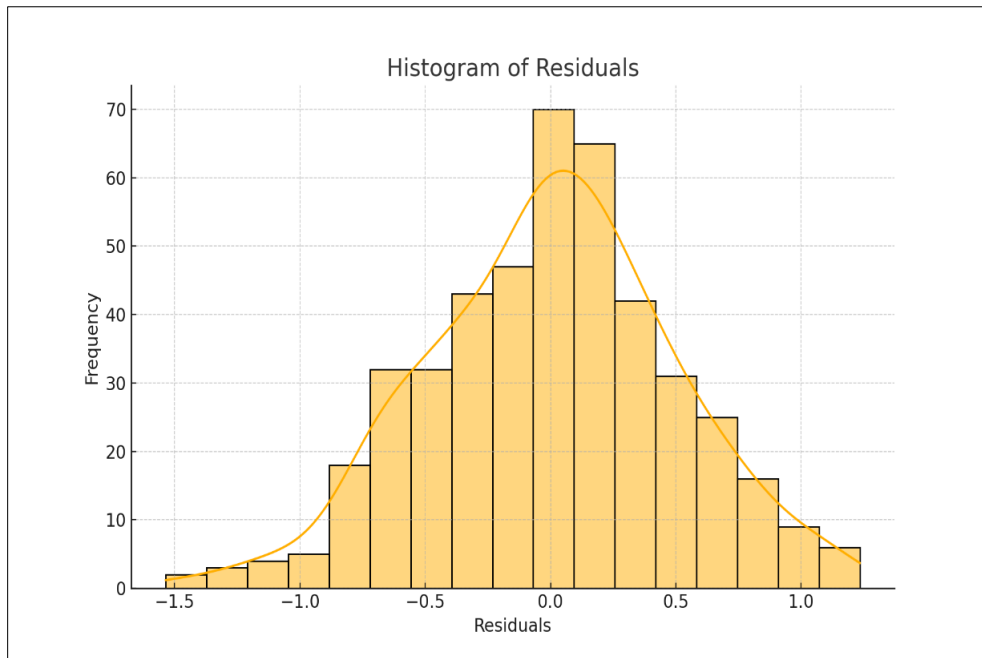
Figure 9. Histogram of Residuals: Assessing Normality in Regression Model

4.3.4 Q-Q Plot of Residuals

The Q-Q plot is used to test normality of residuals of the models, if the residuals are normally distributed, or there is homoscedasticity, then the points on the Q-Q plot should lie roughly on the reference line. Another essential precondition of the regression model is that residuals of all groups should obey a normal distribution.

It supports the conclusion that the non-normal residuals of the two groups of the predictors (student engagement and career adaptability) to the two indicators of employability outcomes does not raise a serious concern, thus, reinforce the validity of the results obtained. Figure 10 in the form of Q-Q plot of residuals is used to check the assumption of normality of residuals in the given regression model. A test for normal distribution of the residuals is therefore inconclusive though the graphs show that the residuals are almost perfectly aligned to the reference line. This also helps in asserting the normality assumption as well as going further in enhancing the results of the regression analysis.
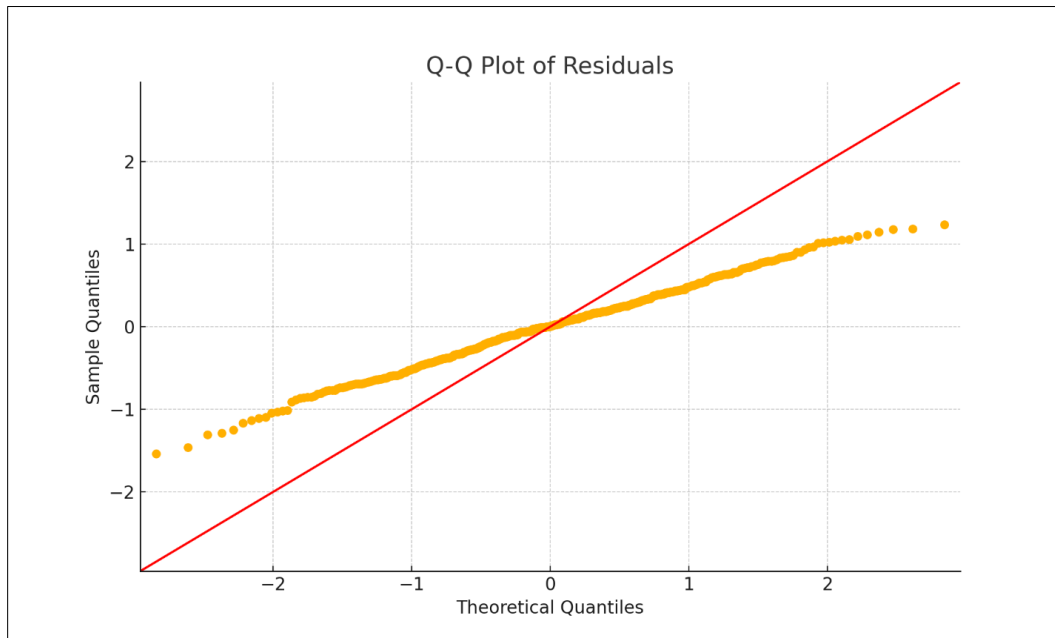
Figure 10. Q-Q Plot of Residuals: Assessing Normality in Regression Model

Table 7 presents the test results of the assumptions made in the regression models applied in this research study. The tests confirm that all key assumptions are met. Linearity is checked through the scatter plots while the coefficient of determination is checked through Durbin-Watson statistic through residual plot we check homoscedasticity, histogram and Q-Q plot to check normality of residuals and finally check for multicollinearity through VIF which is equal to 1.00 for both student engagement and career adaptability. These results ensure the reliability and validity of the regression analysis carried out.

Table 7. Assumption Testing for Regression Models

Assumption	Test	Results
Linearity	Scatterplots	Visual inspection confirms linearity (see scatterplots)
Independence of Errors	Durbin-Watson statistic	2.06 (indicates no autocorrelation)
Homoscedasticity	Residual plots	Visual inspection confirms homoscedasticity (see residual plot)
Normality of Residuals	Histogram and Q-Q plots	Visual inspection confirms normality (see histogram and Q-Q plot)

| Multicollinearity | Variance Inflation Factors (VIF) | Student Engagement: 1.00, Career Adaptability: 1.00 (indicates no multicollinearity) |

4.4 Discussion

The research investigated the relationship between student engagement, career adaptability, and the jobs market for university graduates. The findings indicated that the current research on these significant antecedent factors affecting graduate performance. First, the total positive correlation between career adaptability and employability outcomes backs up what other studies have found about how important it is to be able to adapt to changing labor market conditions in today's business world. According to Maggiori et al. (2017), career adaptability is a psychological resource. Furthermore, the postmodern perspective reflects an individual's ability and willingness to engage in vocational development and meet the present and future demands of the job market. Xia et al. (2021) pointed out that higher levels of career adaptability led to enhanced employment outcomes for the graduates. To be precise, the current regression analysis indicated that career adaptability was a significant determinant of successful completion of the transition to the work force. This implies that the graduates showing high levels of adaptability to complex changes are likely to succeed in their search for jobs in the market.

Moreover, this study affirms the conclusions made in other studies on how transferable skills impact employability. The soft skills, such as communication, teamwork, and problem solving, hold significant importance in the workplace due to their transferability and increased demand (Jackson & Tomlinson 2020). Thus, we effectively communicated that graduates can transfer their acquired skills to a different work environment, thereby enhancing their employment prospects and job performance. The study analyzed the significance of the social support networks in the process of career-building and obtaining a job. As in many previous studies, our research shows that social support is positively associated with employability. Family and friends, as well as university support in terms of resources, information, and encouragement, are vital in achieving the graduates' goal (Chen et al., 2020).

The data showed that students who received high levels of support from their mentors, peers, and family members were more likely to secure more favorable employment outcomes. Khoso et al. (2022) emphasized the importance of social networks in career self-management processes, whose major tasks, as noted above, include the acquisition of opportunities as well as career protection and promotion. Finally, the study revealed that prominent aspects such as the degree of engagement have a robust influence on the employment prospects of students. Highly engaged students perform better academically and demonstrate better recruitment strategies, according to their career preparedness, recruitment processes, and employer perceptions of their employability. Students' involvement in learning activities develops the attitude, skill, experience, and capacity that prepares them for the job market. Additionally, these findings have significant theoretical implications. These relations underpin different legal systems, which influence the selection of contractual partners and performance evaluation criteria in the capital accumulation relations.

5. PRACTICAL IMPLICATIONS

The implications of this study are very clear and specific for universities, policymakers, and employers who want to promote graduate employment. Firstly, regarding career learning, universities should aim at the institutionalization of special modules that would enhance such competencies as flexibility, patience,

endurance, and the ability to find a suitable job. Simulation-based learning closely mimics the contemporary job market scenario, aiding in the sharpening of pertinent skills before students transition into the job market. The study also emphasizes the transferable skills. Universities should therefore deliberately introduce and integrate subject crossings as well as realistic learnings that prepare students for diverse openings in different sectors to enhance their employer uptake in the fiercely competitive employment landscape. The outcome also underscored the significance of establishing robust social support networks within the university environment. The use of planned teacher or tutor systems and peer support groups will enable students to receive timely professional direction, fellowship, and counselling. Particular consideration should be given to the growth of international students and the provision of support for specific circumstances.

6. CONCLUSION & RECOMMENDATIONS

The study's findings concluded that university graduates' employment prospects are highly associated with career adaptability, transferable skills, sources of social support, and student engagement. Career adaptability has the greatest impact on employability, implying that higher education institutions should incorporate adaptability training in order to prepare learners to fit in the current dynamic market. We also established that interdisciplinary and practical teaching methods are crucial for acquiring transferable skills, as these soft skills aid in integrating into the job industry. The analysis of the findings also revealed that social support, both within and outside the university, plays a crucial role in career acquisition. Therefore, we recommend the implementation of mentorship and professional development programs. Furthermore, the study found that active student participation had an impact on employability, implying that universities should encourage students to participate in learning activities as well as other co-curricular activities. The study has implications for universities in terms of graduates' employability skills, as well as for policymakers in terms of designing and implementing educational initiatives and policies to improve graduates' workforce preparedness.

6.1 Limitations and Future Research

Some limitations of the study include the selection of the sample from only two universities in Guangzhou, which may limit the generalizability of the results to other higher education institutions in China or other countries. Further studies should try to use a wider participation of universities from different areas to increase the external validity of the outcomes. Furthermore, this study employs a cross-sectional method that only takes information at a specific time and does not demonstrate variation in terms of employability as graduates enter the workplace. The change in these variables is best captured in longitudinal studies, thus widely recommended as a way of establishing the nature of relationships between career adaptability, engagement, social support, and employability outcomes.

Secondly, the use of self-reported data means that there is a possibility of response bias from respondents, which could exaggerate or underestimate their levels of career adaptability, engagement, and perceived social support. Therefore, it is critical to include objective data for comparison in future research, such as an employer's evaluation of an employee or independent testing. However, this research did not delve into nuanced aspects such as digital literacy and technological competencies, despite their increasing importance in today's global employment landscape. Simultaneously, this study provided valuable insights into positive constructs such as career adaptability, transferable skills, and social supports.

Therefore, more research is required to establish the connection between these competencies and employability, and to gain a deeper understanding of their application in the context of current organizational digitization. There is also a dearth of studies evaluating the best practices and policies that universities and policymakers can implement to enhance employability, providing guidance that will directly assist graduates entering the job market.

REFERENCES

Abid, T., Zahid, G., Shahid, N., & Bukhari, M. (2021). Online teaching experience during the COVID-19 in Pakistan: Pedagogy–technology balance and student engagement. *Fudan Journal of the Humanities and Social Sciences*, *14*(3), 367-391. https://doi.org/10.1007/s40647-021-00325-7

Adipat, S., Laksana, K., Busayanon, K., Asawasowan, A., & Adipat, B. (2021). Engaging students in the learning process with game-based learning: The fundamental concepts. *International Journal of Technology in Education*, *4*(3), 542-552. https://doi.org/10.46328/ijte.169

Alpay, E., & Walsh, E. (2008). A skills perception inventory for evaluating postgraduate transferable skills development. *Assessment & Evaluation in Higher Education*, *33*(6), 581-598. https://doi.org/10.1080/02602930701772804

Baluku, M. M., Mugabi, E. N., Nansamba, J., Matagi, L., Onderi, P., & Otto, K. (2021). Psychological capital and career outcomes among final year university students: The mediating role of career engagement and perceived employability. *International Journal of Applied Positive Psychology*, *6*(1), 55-80. https://doi.org/10.1007/s41042-020-00040-w

Benlahcene, A., Kaur, A., & Awang-Hashim, R. (2021). Basic psychological needs satisfaction and student engagement: The importance of novelty satisfaction. *Journal of Applied Research in Higher Education*, *13*(5), 1290-1304. https://doi.org/10.1108/jarhe-06-2020-0157

Boo, S., Wang, C., & Kim, M. (2021). Career adaptability, future time perspective, and career anxiety among undergraduate students: A cross-national comparison. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *29*(1), 100328. https://doi.org/10.1016/j.jhlste.2021.100328

Bouchrika, I., Harrati, N., Wanick, V., & Wills, G. (2019). Exploring the impact of gamification on student engagement and involvement with e-learning systems. *Interactive Learning Environments*, *29*(8), 1244-1257. https://doi.org/10.1080/10494820.2019.1623267

Carvalho, L., & Mourão, L. (2021). Career adaptability, perceptions of professional development and employability: A mediation analysis. *Psico-USF*, *26*(4), 697-705. https://doi.org/10.1590/1413-82712021260408

Chen, H., Fang, T., Liu, F., Pang, L., Wen, Y., Chen, S., & Gu, X. (2020). Career adaptability research: A literature review with scientific knowledge mapping in web of science. *International Journal of Environmental Research and Public Health*, *17*(16), 5986. https://doi.org/10.3390/ijerph17165986

Chui, H., Li, H., & Ngo, H. Y. (2022). Linking protean career orientation with career optimism: Career adaptability and career decision self-efficacy as mediators. *Journal of Career Development*, *49*(1), 161-173. https://doi.org/10.1177/0894845320912526

Coates, H. (2007). A model of online and general campus-based student engagement. *Assessment & Evaluation in Higher Education*, *32*(2), 121-141. https://doi.org/10.1080/02602930600801878

Collie, R. J., Granziera, H., Martin, A. J., Burns, E. C., & Holliman, A. J. (2020). Adaptability among science teachers in schools: A multi-nation examination of its role in school outcomes. *Teaching and Teacher Education*, *95*, 103148. https://doi.org/10.1016/j.tate.2020.103148

Delle, E., & Searle, B. (2022). Career adaptability: The role of developmental leadership and career optimism. *Journal of Career Development*, *49*(2), 269-281.

https://doi.org/10.1177/0894845320930286

Dogan, U. (2015). Student engagement, academic self-efficacy, and academic motivation as predictors of academic performance. *The Anthropologist*, *20*(3), 553-561. doi.org/10.1080/09720073.2015.11891759

Geraghty, J. R., Young, A. N., Berkel, T. D., Wallbruch, E., Mann, J., Park, Y. S., Hirshfield, L. E., & Hyderi, A. (2020). Empowering medical students as agents of curricular change: A value-added approach to student engagement in medical education. *Perspectives on Medical Education*, *9*(1), 60-65. https://doi.org/10.1007/s40037-019-00547-2

Green, Z. A., Noor, U., & Hashemi, M. N. (2020). Furthering proactivity and career adaptability among university students: Test of intervention. *Journal of Career Assessment*, *28*(3), 402-424. https://doi.org/10.1177/1069072719870739

Guo, Y., Guan, Y., Yang, X., Xu, J., Zhou, X., She, Z., Pan, Z., & Fu, M. (2014). Career adaptability, calling and the professional competence of social work students in China: A career construction perspective. *Journal of Vocational Behavior*, *85*(3), 394-402.https://doi.org/10.1016/j.jvb.2014.09.001.

Hamzah, S. R. A., Kai Le, K., & Musa, S. N. S. (2021). The mediating role of career decision self-efficacy on the relationship of career emotional intelligence and self-esteem with career adaptability among university students. *International Journal of Adolescence and Youth*, *26*(1), 83-93. https://doi.org/10.1080/02673843.2021.1886952

Huang, X., Cao, J., Zhao, G., Long, Z., Han, G., & Cai, X. (2022). The employability and career development of finance and trade college graduates. *Frontiers in Psychology*, *12*, 719336. https://doi.org/10.3389/fpsyg.2021.719336

Jackson, D., & Tomlinson, M. (2020). Investigating the relationship between career planning, proactivity and employability perceptions among higher education students in uncertain labour market conditions. *Higher Education*, *80*(3), 435-455. https://doi.org/10.1007/s10734-019-00490-5

Jia, Y., Hou, Z. J., Zhang, H., & Xiao, Y. (2022). Future time perspective, career adaptability, anxiety, and career decision-making difficulty: Exploring mediations and moderations. *Journal of Career Development*, *49*(2), 282-296. https://doi.org/10.1177/0894845320941922

Kaushik, M. K., & Agrawal, D. (2021). Influence of technology readiness in adoption of e-learning. *International Journal of Educational Management*, *35*(2), 483-495. https://doi.org/10.1108/ijem-04-2020-0216

Kengatharan, N. (2020). The effects of teacher autonomy, student behavior and student engagement on teacher job satisfaction. *Educational Sciences: Theory & Practice*, *20*(4), 1-15. https://doi.org/10.12738/jestp.2020.4.001

Khoso, A. K., Darazi, M. A., Mahesar, K. A., Memon, M. A., & Nawaz, F. (2022). The impact of ESL teachers' emotional intelligence on ESL Students academic engagement, reading and writing proficiency: Mediating role of ESL students' motivation. *International Journal of Early Childhood Special Education, 14*(1)*, 3267-3280. https://doi.org/10.9756/INT-JECSE/V14I1.393

Khoso, A. K., Khurram, S., & Chachar, Z. A. (2024). Exploring the effects of embeddedness-emanation feminist identity on language learning anxiety: A case study of female english as a foreign language (EFL) learners in higher education institutions of Karachi. *International Journal of Contemporary Issues in Social Sciences, 3*(1), 1277-1290.

Kim, J. H., & Shin, H. S. (2020). Effects of self-reflection-focused career course on career search efficacy, career maturity, and career adaptability in nursing students: A mixed methods study. *Journal of Professional Nursing*, *36*(5), 395-403. https://doi.org/10.1016/j.profnurs.2020.03.003

Lee, I., Ali, S., Zhang, H., DiPaola, D., & Breazeal, C. (2021, March). Developing middle school students' AI literacy. In *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education* (pp. 191-197). https://doi.org/10.1145/3408877.3432513

Li, H., Yu, X., Mei, Y., Liu, X., Li, L., & Luo, N. (2021). The effect of grit on career adaptability of Chinese college students based on the self-regulatory processes. *Frontiers in Psychology*, *12*, 795153. https://doi.org/10.3389/fpsyg.2021.795153

Liu, X., Peng, M. Y. P., Anser, M. K., Chong, W. L., & Lin, B. (2020). Key teacher attitudes for sustainable development of student employability by social cognitive career theory: The mediating roles of self-efficacy and problem-based learning. *Frontiers in Psychology*, *11*, 546610. https://doi.org/10.3389/fpsyg.2020.01945

Ma, Y., Bennett, D., & Chen, S. C. (2023). Perceived organizational support and university students' career exploration: The mediation role of career adaptability. *Higher Education Research & Development*, *42*(4), 903-919. https://doi.org/10.1080/07294360.2022.2115983

Ma, Y., Huang, G., & Autin, K. L. (2021). Linking decent work with academic engagement and satisfaction among first-generation college students: A psychology of working perspective. *Journal of Career Assessment*, *29*(1), 148-163. https://doi.org/10.1177/1069072720943153

Maggiori, C., Rossier, J., & Savickas, M. L. (2017). Career adapt-abilities scale–short form (CAAS-SF) construction and validation. *Journal of Career Assessment*, *25*(2), 312-325. https://doi.org/10.1177/1069072714565856

Magnano, P., Lodi, E., Zammitti, A., & Patrizi, P. (2021). Courage, career adaptability, and readiness as resources to improve well-being during the university-to-work transition in Italy. *International Journal of Environmental Research and Public Health*, *18*(6), 2919. https://doi.org/10.3390/ijerph18062919

Monteiro, S., Ferreira, J. A., & Almeida, L. S. (2020). Self-perceived competency and self-perceived employability in higher education: The mediating role of career adaptability. *Journal of Further and Higher Education*, *44*(3), 408-422. https://doi.org/10.1080/0309877x.2018.1542669

Ocampo, A. C. G., Reyes, M. L., Chen, Y., Restubog, S. L. D., Chih, Y. Y., Chua-Garcia, L., & Guan, P. (2020). The role of internship participation and conscientiousness in developing career adaptability: A five-wave growth mixture model analysis. *Journal of Vocational Behavior*, *120*, 103426. https://doi.org/10.1016/j.jvb.2020.103426

Oliveira, Í. M., de Castro, I., Silva, A. D., & Taveira, M. D. C. (2023). Social-emotional skills, career adaptability, and agentic school engagement of first-year high school students. *International Journal of Environmental Research and Public Health*, *20*(8), 5597. https://doi.org/10.3390/ijerph20085597

Panigrahi, R., Srivastava, P. R., & Sharma, D. (2018). Online learning: Adoption, continuance, and learning outcome—A review of literature. *International Journal of Information Management*, *43*, 1-14. https://doi.org/10.1016/j.ijinfomgt.2018.05.005

Parola, A., & Marcionetti, J. (2022). Career decision-making difficulties and life satisfaction: The role of career-related parental behaviors and career adaptability. *Journal of Career Development*, *49*(4), 831-845. https://doi.org/10.1177/0894845321995571

Rasheed, M. I., Okumus, F., Weng, Q., Hameed, Z., & Nawaz, M. S. (2020). Career adaptability and employee turnover intentions: The role of perceived career opportunities and orientation to happiness in the hospitality industry. *Journal of Hospitality and Tourism Management*, *44*(3), 98-107. https://doi.org/10.1016/j.jhtm.2020.05.006

Rivera, M., Shapoval, V., & Medeiros, M. (2021). The relationship between career adaptability, hope, resilience, and life satisfaction for hospitality students in times of Covid-19. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *29*, 100344. https://doi.org/10.1016/j.jhlste.2021.100344

Rudolph, C. W., Lavigne, K. N., & Zacher, H. (2017). Career adaptability: A meta-analysis of relationships with measures of adaptivity, adapting responses, and adaptation results. *Journal of Vocational Behavior*, *98*, 17-34. https://doi.org/10.1016/j.jvb.2016.09.002

Santilli, S., di Maggio, I., Ginevra, M. C., Nota, L., & Soresi, S. (2020a). 'Looking to the future and the university in an inclusive and sustainable way': A career intervention for high school students. *Sustainability*, *12*(21), 9048. https://doi.org/10.3390/su12219048

Santilli, S., Grossen, S., & Nota, L. (2020b). Career adaptability, resilience, and life satisfaction among Italian and Belgian middle school students. *The Career Development Quarterly*, *68*(3), 194-207. https://doi.org/10.1002/cdq.12231

Sarason, I. G., Levine, H. M., Basham, R. B., & Sarason, B. R. (1983). Assessing social support: The social support questionnaire. *Journal of Personality and Social Psychology*, *44*(1), 127-139. https://doi.org/10.1037//0022-3514.44.1.127

Shenoy, V., Mahendra, S., & Vijay, N. (2020). COVID 19 lockdown technology adaption, teaching, learning, students engagement and faculty experience. *Mukt Shabd Journal*, *9*(4), 698-702.

Tani, M., Gheith, M. H., & Papaluca, O. (2021). Drivers of student engagement in higher education: A behavioral reasoning theory perspective. *Higher Education*, *82*(3), 499-518. https://doi.org/10.1007/s10734-020-00647-7

Veluvali, P., & Surisetti, J. (2022). Learning management system for greater learner engagement in higher education—A review. *Higher Education for the Future*, *9*(1), 107-121. https://doi.org/10.1177/23476311211049855

Xia, T., Gu, H., Huang, Y., Zhu, Q., & Cheng, Y. (2020). The relationship between career social support and employability of college students: A moderated mediation model. *Frontiers in Psychology*, *11*, 28. https://doi.org/10.3389/fpsyg.2020.00028

Xu, C., Gong, X., Fu, W., Xu, Y., Xu, H., Chen, W., & Li, M. (2020). The role of career adaptability and resilience in mental health problems in Chinese adolescents. *Children and Youth Services Review*, *112*(2), 104893. https://doi.org/10.1016/j.childyouth.2020.104893

Zhang, H., Lee, I., Ali, S., DiPaola, D., Cheng, Y., & Breazeal, C. (2023). Integrating ethics and career futures with technical learning to promote AI literacy for middle school students: An exploratory study. *International Journal of Artificial Intelligence in Education*, *33*(2), 290-324. https://doi.org/10.1007/s40593-022-00293-3

Zhang, K., Wu, S., Xu, Y., Cao, W., Goetz, T., & Parks-Stamm, E. J. (2021). Adaptability promotes student engagement under COVID-19: The multiple mediating effects of academic emotion. *Frontiers in Psychology*, *11*, 633265. https://doi.org/10.3389/fpsyg.2020.633265

Zhong, Y., Busser, J., Shapoval, V., & Murphy, K. (2021). Hospitality and tourism student engagement and hope during the COVID-19 pandemic. *Journal of hospitality & tourism education*, *33*(3), 194-206. https://doi.org/10.1080/10963758.2021.1907197

Socioeconomic and Environmental Determinants of Household Willingness to Pay for Improved Electricity Services: A Case Study of Nowshera, Pakistan

Farah Naz[1]*and Shehryar Ahmed[2]

[1]Institute of Management Sciences (IM Sciences), Peshawar, 25000, Khyber Pakhtunkhwa, Pakistan

[2]Department of Business and Management, Kohat university of Science & Technology (KUST), Kohat, Pakistan

Article Information	ABSTRACT
    Corresponding Author: **Farah Naz** farahnaz263@gmail.com https://orcid.org/0009-0008-2324-2762	Electricity is critical to our daily lives, and frequent interruptions in the electricity supply impact not only industrial productivity and economic growth but also disrupt household activities and daily routines. This study aims to determine the factors influencing a household's willingness to pay additional charges for improved electricity service. The study collected primary data through the contingent valuation method from 285 households from Nowshera, Pakistan, and applied binary logistic regression estimation. The findings show that a household's education level, household size, monthly income, monthly electricity bill, and service reliability significantly influence consumers' willingness to pay additional charges to get satisfactory electricity service. Furthermore, as various household activities rely on electricity, households are typically willing to pay an extra amount for better electricity service. The study also highlights that environmental awareness and attitudes towards renewable energy resources influence consumer preferences. Furthermore, those who are more conscious of sustainability exhibit a greater willingness. This study is unique in that it comprehensively assesses the socioeconomic and behavioural aspects affecting the willingness to pay for reliable power in a developing country, specifically Nowshera, Pakistan. Unlike earlier studies, it investigates the impact of household activities on willingness to pay, shedding light on how cultural, religious, and social interactions influence energy preferences. Furthermore, the study emphasizes the adoption of renewable energy as an electricity service for the consumer, providing a dual benefit of improved service reliability and a sustainable energy source. **Keywords:** Environmental; Socioeconomic; Uninterrupted Electricity; Reliable Supply; Willingness to Pay; Pakistan

1. INTRODUCTION

Energy exists in various forms, both renewable and non-renewable, and plays a vital role in our daily lives. Electrical energy is crucial in economic development (Ahmad et al., 2019; Strielkowski et al., 2021). Presently, it has wide application in our daily lives, and the interruption negatively affects daily activities (Gupta et al., 2016).

A consistent supply of electrical energy can achieve optimal level of agriculture and industrial productivity (De Nooij et al., 2007). An increase in per capita electricity consumption will also improve the standard of living (Niu et al., 2016). Water and Power Development Authority (WAPDA) and Karachi Electric (K-Electric) are the two public sectors which primarily generate, transmit, and distribute electricity in Pakistan (Kamran et al., 2019). However, 42 other independent power producers (IPPs) play a significant role in the electricity-generating sector to meet the country's increasing demands (Qudrat-Ullah, 2015). There are 13 distribution companies (DISCO) under Pakistan Electric Power Company (PIPCO), assigned with the authority to distribute electricity to their respective areas (Masroor et al., 2021).

According to Government of Pakistan Finance Division (2023), data indicates that the country's cumulative capacity of electricity generation is 41,000 MW. Hydel power generators contribute 25.8% of the total electricity generation capacity. In contrast, the installed capacity of thermal, nuclear, and renewable is about 58.8%, 8.6%, and 6.8% respectively, with an addition of 3% by Thar coal-based power projects that achieved commercial operations during the current fiscal year. In addition to this, the Government of Pakistan approved the framework guidelines for fast-track solar initiatives on October 18, 2022. Its key pillars include substituting expensive imported fossil fuels with solar photovoltaic (PV) energy, solar PV generation on 11 kV feeders, and solarization of public buildings. Moreover, the six nuclear power projects, which had an installed capacity of 3,530 MW, supplied about 18,739 million units of electricity to the national grid during FY 2023 (Mar–July).

Khyber Pakhtunkhwa is the land of hospitality, comprehensive culture, astonishing history, legendary conquerors, and prevails as a hub of tourism. The province is located in the northwestern region of the country. Its total area is 101,741 km², and its 35 million population makes 11.9% of Pakistan's population. The province contributes 10% of Pakistan's GDP and 20% of mining output (KPITB, n.d.).

The national transmission and distribution companies had about 62 stations of 220KV. They intended to build 23 grid stations of 500 KV and extend their transmission lines up to 9,000 km. To close this gap, 12,000 km of 120 KV transmission lines were being planned. However, due to inadequate infrastructure, we cannot yet achieve this (Kamal, 2022). The main problem in Pakistan is load shedding, which threatens economic growth and living standards. Though it can be mitigated by improving financial management and fully utilizing existing power generation capacity. Addressing circular debt through timely government tariff subsidies will help distribution companies and IPPs receive payments. Reducing power generation costs by cutting electricity theft and line losses can also lower tariff subsidies (Anwar & Saeed, 2023).

As a counter-measure to electricity shortage, precautionary measures are taken by the government either by installing new plants, taking financial support, or importing energy-producing resources from neighboring countries. The incapacity of hydropower plants due to the unavailability of water causes a shortage in electricity generation, leading to public disturbance and economic loss. Ultimately, owing to a shortage of electricity supply, factories cannot produce surplus material to increase exports and enhance the foreign exchange reserves. Moreover, the shutdown of different industries substantially increases unemployment and poverty levels (Sibtain et al., 2021). This entails that there is an increasing demand of electricity supply nation-wide. Government policies, if not well-regulated according to the energy needs of all sectors of society, negatively affect the economy. The closure of factories may be attributed to the rising cost of crude oil for electricity production and it led to a significant rise in unemployment rates and contribute to a poverty level of 5.96% in 2016 (Yang et al., 2022).

Despite rich natural resources rich, Pakistan's energy sector struggles with a supply-demand gap, with demand quadrupling over the past two decades. Energy is crucial for economic growth and influences foreign policy. Pakistan should be an energy-rich Central Asian country but faces political and strategic hurdles, including regional security while securing its energy needs. Therefore, Pakistan requires foreign policy practices (Adnan et al., 2023; Daneshvar et al., 2020).

According to the World Economic Forum (2019), Pakistan continuously struggles to generate more energy. Despite expanding its installed generation capacity from 23,000 MW in 2014 to 33,744 MW by 2019, it still needs to fulfil the country's growing demand. The power-producing system received less attention to enhance the transmission and distribution capacities, infrastructure, and overall system performance, which resulted in 18.3% distribution loss and 2.4% transmission loss. Moreover, unpaid power payments resulted in ongoing circular debt, estimated to be around Rs 1.6 trillion ($7.2 billion). The World Economic Forum Energy Transition Index (ETI) indicates that a sustained government effort might raise the system of incentive energy generation by as much as 46%.

According to Malik (2023), Pakistan has the potential to generate up to 60,000 MV of energy. Limitations exist as its hydroelectric project can only produce a fraction—7000 MV—due to issues related to management and infrastructure. Urgent measures are required from the government to ensure an energy mix system that relies on local production rather than imported energy resources (Unwin, 2019). This study focused on the impact of planned and unplanned power outages on daily life activities, leisure activities, and social life activities and the contributing factors that affect their willingness to pay an additional amount in their monthly electricity bill to get an uninterrupted electricity supply and their satisfactory use. The study investigates a household's willingness to pay for a reliable, continuous electricity supply.

This study is crucial as it addresses the significant issue of energy supply in Pakistan and its broader implications on daily life and economic development. Reliable electricity is fundamental for economic activities and affects industrial output, agricultural productivity, and overall quality of life. With Pakistan facing substantial energy deficits and frequent load shedding, understanding households' willingness to pay for improved electricity services can inform effective policy measures. Additionally, the study highlights the potential of renewable energy sources, which can diversify the energy mix and reduce reliance on imported fossil fuels. By focusing on the determinants influencing willingness to pay and the impact on social and cultural activities, the study provides compelling insights. In this study, the dilemma of improved electricity services is targeted to enhance energy policies, improve living standards, and support economic growth in regions like Khyber Pakhtunkhwa, which plays a crucial role in electricity production through hydropower.

2. LITERATURE REVIEW

2.1 Factors Affecting the WTP for Improved Electricity Service

Taale and Kyeremeh (2016) analyzed factors influencing households' willingness to pay for reliable electricity in Ghana. Using Tobit regression, they found that marital status, education level, monthly income, meter ownership, prior notice of power outages, business ownership, and household size significantly affect willingness to pay, accounting for up to 44% of the monthly bill. In contrast, age, gender, house ownership, and monthly electricity expenditures were insignificant factors. Similarly, Twerefou (2014) examined factors influencing the willingness to pay for improved electricity in Ghana.

47

Poor energy infrastructure, low tariffs, and growing demand led to unmet requests and economic loss for consumers. Consequently, consumers are willing to pay 1.5 times more than the current average rate of Ghanaian cedi (GH¢) 0.2734 per kilowatt-hour. Income, gender, education, and household size significantly affect this willingness to pay. Another researcher Adjei-Mantey (2013), found that people are willing to pay an average GH¢ 0.2667 for uninterrupted electricity service, which is 47% more than the current tariff. Factors such as income, household size, sex of the household head, education level and regular interruptions in current electricity supply influence the willingness to pay. The study recommends government investment in infrastructure, gradual increase in tariffs, providing employment opportunities, higher wages, promotion of education, and installation of hydropower plants.

Improved reliability is one of the key features that consumers demand in an electricity supply. In this regard, Ozbafli and Jenkins (2015) found that households are willing to accept 13.5% increase in monthly electricity bills for improved reliability, generating an economic benefit of $37.7 million from the residential sector alone. This amount could finance power system upgrades to eliminate outages. Replacing old plants with fuel-efficient ones would save $44.6 million in fuel costs. Adopting a high-reliability electricity policy would yield a net benefit of $226 million over five years despite challenges from political instability and misguided policies.

Another study was carried out in India to observe consumer willingness. While using a two-stage model, Gunatilake et al., (2013) studied willingness to pay (WTP) for improved electricity in rural India. They found that bids should be increased from the current electricity service levels to avoid downward bias in WTP estimates for unimproved service. The estimated WTP for improved electricity service is Rs. 340 per month. The study showed that WTP is directly linked to income and is similar across all income groups. The block tariff system effectively managed demand, causing higher-income households to reduce consumption, thereby conserving energy.

Babawale and Awosanya (2014) investigated the willingness to pay for improved electricity using non-market valuation techniques like conjoint, contingent, and multivariate analysis. They concluded that wind power is the most cost-effective method for electricity generation. The "pay-back" analysis revealed low WTP among estate consumers, indicating a lack of support for private sector electricity supply. Factors such as household income, household size, frequency of generator use, employment status of the household head, and the cost of running generators influenced the WTP for improved electricity services.

2.2 Factors of Adapting Renewable Energy

Farhar-Pilgrim (1999) examined consumers' attitudes and knowledge about renewable energy and their willingness to pay (WTP). The study concluded that education about renewable energy enhances customers' readiness to adopt it—however, the percentage of customers willing to pay decreases as the cost of renewable energy increases. Similarly, Duffy et al., (2007) investigated consumer willingness to pay (WTP) for green energy and factors hindering subscription to green energy programs. The study found that lack of awareness is a significant barrier. Awareness campaigns and advertisements can boost consumer interest and increase WTP for green energy. Shih and Chou (2011) initiated a study to observe the factors affecting the adaptation of renewable energy. The researchers examined consumer uncertainties and willingness to pay (WTP) for leasing versus purchasing solar power systems. They found that leasing reduces the risk of adopting new technology.

Conjoint analysis showed that government subsidies, electricity prices, reliability, and latest designs significantly impact WTP for shorter leasing times. Cluster analysis revealed a preference for shorter leasing periods, with leasing times over 20 years equating to purchasing. Furthermore, to analyze the impact of economic and environmental factors on consumer willingness to pay (WTP) for green electricity, Bösche (2016) used linear probability and probit models. The study concluded that environmental factors do not significantly influence WTP, even for those affected by environmental conditions. Instead, economic factors, particularly price levels, are more influential. The study also found that government subsidies have a limited impact on WTP due to consumers' low financial conditions and limited awareness about environmental protection.

In the case of public opinion and willingness to pay (WTP), they have a significant impact on integrating renewable energy into the electricity mix. In this regard, Ntanos et al., (2018) found that lack of awareness and high costs hinder the adoption of renewable energy sources. It stated that increasing environmental awareness leads to greater acceptance of green energy investments. The estimated WTP for 10% renewable energy penetration is 26.5 euros per quarterly electricity bill. The logit model showed a positive association between WTP and factors such as educational level, government energy subsidies, renewable energy implementation, and socio-political motivation. However, several disadvantages involving economic concerns, lack of awareness, and perceived effectiveness might hinder the willingness to pay. To evaluate the differences between consumers' willingness to pay (WTP) for renewable energy and WTP influenced by study design, Ma et al., (2015) used meta-regression analysis. The researchers concluded that study design and administration have a more significant impact on WTP variation than factors like the type of renewable energy, socioeconomic patterns, and energy consumption patterns. The study concluded that consumers showed significantly higher WTP for solar energy than wind and hydro-energy sources.

In terms of socioeconomic factors, Williams (2012) investigated consumer willingness to pay (WTP) for renewable energy, classifying respondents into concerned, protesting class, and WTP classes using Latent Class Modeling. The study identified preference heterogeneity based on attitudes, perceptions, and climate change knowledge. Results showed significant WTP variation among classes, with 83% willing to pay for renewable energy. Tobit regression analysis revealed that age and gender significantly influenced WTP in the concerned group, while the protest class showed no significant socioeconomic factors. In the WTP class, younger individuals and women were more likely to pay for renewable energy.

2.3 Environmental Aspects in Switching Towards Green Energy Resources

Study conducted by Štreimikienė and Mikalauskienė (2014), household willingness to pay (WTP) for renewable energy is compared against WTP with government-supported feed-in prices. The study found that households' WTP for renewable energy is significantly lower due to a lack of awareness about environmental protection in electricity generation compared to subsidized feed-in prices. David (2014) examined consumers' WTP for renewable energy, highlighting that switching from conventional to renewable sources benefits the environment. The study found that economic factors and consumer behavior towards environmental protection and self-image are critical drivers for higher WTP for renewable energy. External factors influencing WTP include electricity price, household income, household size, and education. Jung et al., (2015) studied substituting nuclear energy with renewable energy and found that consumers' ethical reasons rather than economic ones drive more willingness to pay (WTP).

49

Through multiple regression analysis, the study estimated the per capita WTP for renewable energy at 38,921 won, with an additional annual cost of about 2 trillion. Even with nuclear power generating 20 trillion won annually, the unit cost of renewable energy is three times higher, with generating charges of 40 trillion won, posing challenges for its promotion.

2.4 Black Outages and Negative Externalities of Green Energy on WTP

Nkosi (2016) quantified households' willingness to pay for renewable and nuclear energy to avoid outages. Using Heckman's selection model and Cragg's two-step model, the study found that people prefer planned outages over unplanned ones to manage their activities. Despite environmental hazards, nuclear energy provides job opportunities and is favorable in the face of severe unemployment. Preference toward renewable energy is just for its safety and cleanliness. Aweke (2018) also investigated households' willingness to pay (WTP) to avoid blackouts and the negative externalities of wind power. The study concluded that consumers are willing to pay 499 birrs per year (34% of their annual electricity bill) to reduce outages and 374 birrs per year (24% of their perennial bill) to avoid the external costs of wind power. WTP increases with income, household size, number and duration of outages, and a reduction in consumer preference for wind farms. Male respondents have a significantly higher WTP to avoid both effects.

2.5 Self Generation and WTP

Oseni (2017) examined the role of self-generation in households' willingness to pay (WTP) for reliable electricity. The study found that households with self-generation are more willing to pay for reliable electricity despite the marginal cost. Regardless of income level, households are willing to pay 84% more than the current tariff for improved service, preferring reliable, expensive electricity over subsidized, low-quality supply.

Pasha and Saleem (2013) quantified the impact of power outages and the cost of self-generating electricity. They concluded that the people prefer to pay more for uninterrupted power to maintain economic activity. Load-shedding rates vary across Pakistan, affecting social activities and the economy. Self-generation is expensive but prevalent in Sindh and KPK among high-income communities. Moreover, 28% of people use generators and 30% use Uninterrupted Power Supply (UPS). The study suggests substantial improvement in the power transmission and distribution sector.

2.6 Government Strategies and WTP

Cust et al. (2007) discussed rural electrification demand and technology options, proposing a Distributed Decentralized Generation (DDG) project using renewable energy to reduce reliance on the costly national grid. This approach encourages community support for renewable energy and bill payment regulation. The study suggests that collaboration between local groups and external agents is more effective than individual leadership. Large-scale electrification requires regulatory adjustments and financial support for implementation, operation, and maintenance, promoting the expansion of rural electrification.

Graber et al. (2018) compared solar microgrids and centralized grid systems, using choice experiments to assess reliability, availability and price. The study found that non-consumers prefer microgrids due to better power, price, and reliability despite the lower costs of centralized grids lacking these attributes. It recommends that policymakers should focus on expanding microgrid electrification.

Alinsato (2015) investigated household preferences for reliable electricity service to avoid outages. Through a random parameter as Tobit model, the study found that consumers prefer electricity availability during weekends over nighttime on weekdays and that willingness to pay increases with the duration of outages. The study noted that effective pricing policies do not encourage consumer preferences for reliability, suggesting that the government should improve electricity planning and operations.

Ward (2010) examined consumer willingness to pay (WTP) for two energy programs: Energy Star (energy efficiency) and Green Power Partnership (green energy purchasing). Through conditional and mixed logit models, the study found that WTP for Energy Star labels ranges from \$237.81 to \$350.54 and for Green Power Partnership labels from \$48.52 to \$70.95. Demographic and attitudinal factors influence WTP, with consumers (especially males) showing greater WTP for Energy Star labels. It is noted that energy labels significantly impact consumers' decisions when purchasing electrical appliances.

Ali and Nawaz (2013) concluded that energy crises in Pakistan stem from mismanagement in the power sector, causing the textile sector to suffer production losses of 23%-65% during 8-hour shifts and 21%-60% during 10-hour shifts due to frequent electricity interruptions. The spinning, dying, and chemical processing subsectors face significant losses, exacerbating unemployment. The study found that 79% of textile firms are willing to pay Rs 1 to Rs 20 per energy unit for uninterrupted services. The government must take action to prevent further decline in the textile sector.

Qasim and Kotani (2014) examined factors influencing energy consumption in Pakistan from 1970 to 2010 using co-integration and error correction models. They found that price levels, real income, power generation sources, and utilization of installed power plants significantly affect energy consumption patterns. The study concluded that consumer energy demands should adjust to prices in the long term, and private power producers should utilize underused fossil fuel plants. Encouraging private producers to provide an uninterrupted electricity supply is recommended. A non-linear relationship exists between electricity, oil, and gas demand. The study suggested that price adjustments are inefficient for addressing short-term power outages and emphasized improving the utilization rate of existing plants over new installations. Ifat (2018) examined factors influencing households' willingness to pay (WTP) for renewable energy, using data from 8,500 domestic units. Through ordered logit and binary probit models, the study concluded that solar awareness and socioeconomic determinants significantly impact WTP. Governments in developing countries should design policies for affordable solar home systems.

3. METHODOLOGY

3.1 Empirical Model

The framework incorporated in this study followed the Random Utility Model (RUM) (Lancaster, 1966; McFadden, 2001). The random utility model assumes that the utility acquired by the consumer "i" derived from any commodity "j" (U_{ij}) is the function of some visible aspects of the consumer for the commodity consumed and some unobservable random error e_{ij}. The utility function, which is related to the indirect utility function, can be expressed in Equation 1 as:

$$U_{ij} = U_i (Y_j, X_j, e_{ij}) \text{ ---------- Equation 1}$$

Here, Y_i is the income of the individual j, X_j is the noticeable aspect of the individual for a specific commodity, and e_{ij} is some unobservable random error.

If we measure a change in the quality of commodity through contingent valuation survey, then initiate a payment bid $Y_i *$. It indicates the consumer will agree to an additional payment suggestion if derived utility from improved quality is more than the initial one. It will be like:

$$U_{ij} (Y_j - Y_i *, X_j, e_{ij}) > U_{ij} (Y_j, X_j, e_{ij}) \ldots\ldots\ldots\ldots \quad \text{Equation 2}$$

Here $Y_i *$ shows the additional amount that the consumer is willing to pay for the improved quality of goods. It will have some probability, and all those responding yes in the survey asserted their preferences for the improvement. Thus, the probability (Pr) for the answer yes can be written as:

$$Pr \ (yes) \ = U_{ij}(Y_j - Y_j *, X_j, e_{ij}) > U_{ij} (Y_j, X_j, e_{ij}) \ldots\ldots\ldots\ldots \quad \text{Equation 3}$$

According to the basic formulation, the Random Utility Model (RUM) is additive. As a result, the utility function can be separated additively into observable and unobservable parts, following the model called Additive Random Utility Model (ARUM). Now Equation 1 is written as;

$$U_{ij} \ = \ U_{ij} \ (Y_j, X_j) \ + e_{ij} \qquad \ldots\ldots\ldots\ldots\ldots \qquad \text{Equation 4}$$

While, the probability for the answer "yes" showing their preferences for induced bid will become:

$$Pr \ (yes) \ = \ U_{1j} \ (Y_j - Y_i *, X_j) \ + \ e_{1j} > U_{0j} \ (Y_j, X_j) \ + \ e_{0j} \ldots\ldots\ldots.. \ \text{Equation 5}$$

We knew that WTP is the extra amount an individual willingly pays for the improved electricity supply service. It is the function of consumer socioeconomic attributes and essential qualities of electricity supply. It means that any change in the utility derived from the improved electricity supply is considered an equal change in the deterministic and non-deterministic components of the Random Utility Model. Thus, the WTP may be written as;

$$WTP_i = \beta_i X_i \ + e_i \ldots\ldots\ldots\ldots\ldots \qquad \text{Equation 6}$$

Here, β_i is the estimated parameter, X_i represents the consumer's socioeconomic attribute and essential qualities of electricity supply and e_i is the random variable concluding the other characteristics of the consumer's WTP that haven't been concluded. It assumed that random variable "e_i" followed the standard normal distribution with zero mean and variance of one. The estimated willingness to pay is presented as the following equation:

$$WTP_i = \beta_0 + \beta_1 SEX_i + \beta_2 HEDU_i + \beta_3 HSIZ_i + \beta_4 HMI_i + \beta_5 CMEB_i + \beta_6 REL_i + \beta_7 PRNTF_i + \beta_8 EDO_i + \beta_9 COD_i + \beta_{10} SPA_i + \beta_{11} RELA_i + \beta_{12} CULA_i + \varepsilon_i$$

3.2 Description of Explanatory Variables

3.2.1 Gender of the Household (SEX)

Gender is a dummy variable, with 1 representing males and 0 representing females. Males generally manage household expenditures and decide on payments for improved electricity services, though some employed females also contribute and influence decisions. The impact of gender on willingness to pay for improved electricity services is unclear and shows an unexpected pattern.

3.2.2 Household Educational Level (HEDU)

The household's educational level, a categorical variable, is positively related to willingness to pay for improved electricity supply. Highly educated individuals recognize its importance in development, leading to a higher willingness to pay. In contrast, those with little or no formal education are less likely to support paying for service improvements due to limited use.

3.2.3 Household Size (HSIZ)

Household size, a continuous variable, unpredictably influences willingness to pay (WTP) for improved electricity. Some larger households, needing more electricity, are willing to pay more due to frequent interruptions. However, other large households may not be willing to pay higher amounts if most members are unemployed and household expenses are focused elsewhere.

3.2.4 Household Monthly Income (HMI)

Household income, a continuous variable, represents the combined monthly income of all working members, typically led by the household head. Willingness to pay for better electricity service depends on the head's affordability. Contributions from other members may encourage the head to pay more for improved service, benefiting the entire household. According to consumer demand theory, a positive relationship exists between income and the demand for ordinary goods, meaning higher income leads to greater demand for improved electricity services.

3.2.5 Current Monthly Electricity Bill (CMEB)

The current monthly electricity bill, a continuous variable, reflects the electricity expenses of household. Families with high bills may resist paying more, believing they already pay enough. Others with high bills may continue to pay more for better service. Conversely, households with lower bills might be willing to pay extra for improvements, though some may not, due to minimal electricity use.

3.2.6 Reliability of Electricity Supply (REL)

Reliability is a dummy variable, with 1 representing reliable power and 0 representing unreliable power. Households with unreliable electricity are more willing to pay for improvements, while those with reliable service are less willing to pay extra. There is an expected negative relationship between power reliability and willingness to pay additional charges for improved service.

3.2.7 Prior Notification Given Before Electricity Shortage (PRNTF)

Prior notification is a dummy variable, with 1 indicating prior notification before blackouts and 0 indicating no notification. Households that receive prior notification experience fewer losses and are less likely to pay more for improved power service. In contrast, those facing unplanned outages, which cause significant losses, are more willing to pay for service upgrades. It reflects a negative relationship between prior notification and the willingness to pay for improved electricity service.

3.2.8 Effectiveness due to Outages (ADO)

Effectiveness due to outages is a dummy variable, with 1 indicating that outages significantly affect willingness to pay and 0 indicating no effect. Consumers heavily affected by power outages are highly willing to pay more for improved electricity service, while those less affected are not willing to pay additional charges.

3.2.9 Cost of Damage (COD)

The cost of damage, a continuous variable, represents the economic loss households face due to frequent power interruptions. It is positively related to willingness to pay, meaning households suffering significant financial losses are more likely to pay extra to avoid these disruptions. Conversely, those with minimal losses are less willing to pay for improved electricity service.

3.2.10 Sports Activities (SPA)

Sports activity is a dummy variable, with 1 indicating that power outages affect sports activities and 0 indicating no effect. Those whose sports activities are disturbed by outages are more willing to pay for better electricity service. In contrast, those whose activities are unaffected are unwilling to pay extra for improvements.

3.2.11 Religious Activities (RELA)

Religious activity is a dummy variable, with 1 indicating that outages affect religious activities and 0 indicating no effect. People whose religious activities are affected by power outages are more willing to pay for better electricity service. In contrast, those whose activities are unaffected are less likely to pay extra for improvements.

3.2.12 Cultural Activities (CULA)

Cultural activity is a dummy variable, with 1 indicating that power outages affect cultural activities and 0 indicating no effect. People whose cultural activities are disturbed by outages are more willing to pay for better electricity service, while those whose activities are unaffected are less likely to pay extra. Table 1 summarizes the explanatory variables and their expected effects.

Table 1. Categorization of Explanatory Variables and Their Expected Signs

Variables	Categorizations	Expected signs
Current Monthly Electricity Bill (CMEB)	Continuous	+/-
Gender of the Household (SEX) (Male = 1, Female = 0)	Dummy	+/-
Household Monthly Income (HMI)	Continuous	+/-
Household Size (HSIZ)	Continuous	+/-
Household Educational Level (HEDU)	Categorical	+
Reliability of Electricity Supply (REL) (Reliable = 1, Not reliable = 0)	Dummy	_
Prior Notification given before Electricity Shortages (PRNTF) (Yes = 1, No = 0)	Dummy	_
Effectiveness due to Outages (EDO) (Yes = 1, No = 0)	Dummy	+/-

Cost of Damage (COD)	Continuous	+
Sports Activities (SPA) (Agree=1, Disagree=0)	Dummy	+/-
Religious Activities (RELA) (Agree=1, Disagree=0)	Dummy	+/-
Cultural Activities (CULA) (Agree=1, Disagree=0)	Dummy	+/-

3.3 Type of Data Collected

The study collected data from a primary source within the area of Tehsil Nowshera in District Nowshera. The researcher directly inquired the respondents or households by asking questions about the current power supply situation in their area through questionnaires (Refer to the Appendix A).

3.3.1 Tool for Data Collection

The primary data for this survey was collected using a well-designed questionnaire. The questionnaire evaluated community satisfaction with power services in Tehsil Nowshera, including issues related to voltage reliability and power outages. Respondents were asked about their willingness to pay (WTP) for improvements in electricity service. To ensure accuracy and transparency, the questionnaire, based on the Contingent Valuation method, included questions about current electricity issues and respondents' socioeconomic attributes to assess their WTP for enhanced service.

3.3.2 Description of the Sampling Area

The study surveyed 287 electrified households in rural and urban Tehsil Nowshera, District Nowshera, and Khyber Pakhtunkhwa, Pakistan. Nowshera, located approximately 43 kilometers east of Peshawar in the Valley along the Kabul River, covers an area of 1,748 square kilometers. With a population of 120,131 as of 2017, Nowshera is a crucial economic zone due to the CPEC project and hosts numerous military installations and factories. The city is well-connected by airports, railways, and roads, facilitating communication across Pakistan.

3.3.3 Field Work

The research was conducted from mid-March 2020 to the end of May 2020. Each household in the selected area was interviewed using a convenient sampling technique. Responses were then reviewed for accuracy and consistency.

3.4 Data Analysis and Estimation Techniques

3.4.1 Contingency Valuation Method

Various techniques, such as travel-cost method and choice experiments, estimate non-market goods. This study employed the Contingent Valuation Method (CVM) to assess use and non-use values and determine households' willingness to pay for improved electricity service. The CVM measured how much each household would be willing to pay extra on their monthly bill to avoid the costs associated with power shortages.

During the fieldwork, respondents were asked about the current electricity service, its reliability, and their socioeconomic attributes based on a scenario of improved, reliable, and uninterrupted electricity supply.

3.4.2 Binary Logistic Regression Model

The study used binary logistic regression to estimate households' willingness to pay more for improved electricity service. Logistic regression is suitable for predicting outcomes with two possible values (e.g., yes/no, 1/0) based on one or more independent variables. Unlike simple linear regression, which assumes a linear relationship, logistic regression models assess the relationship between a binary dependent variable and multiple independent variables which can be continuous or categorical. This method allows for predicting one variable's effect while controlling the others' effects.

3.4.2.1 Log Odds of the Logistic Regression Model

Odds represent the ratio of the likelihood of an event occurring to the probability of not occurring, and they offer an alternative way to express probability. In logistic regression, the probability of an event converts into log odds, which is the ratio of the event occurring to the event not occurring. This conversion helps model the relationship between the dependent and independent variables.

3.4.2.2 Uses of the Logistic Regression Model

Logistic regression is used to evaluate the probability of a dichotomous event occurring and to address classification issues. It forecasts the likelihood of "yes" or "no" outcomes, helping data analysts make informed decisions. It can reduce risk, improve spending efficacy, and maximize profits.

4. RESULTS AND ANALYSIS

4.1 Demographic Information

In Nowshera, there is a single WAPDA unit for electricity supply. The sample in Table 2 includes 75 females (26.13%) and 212 males (73.18%). Most respondents (242, 84.32%) face unreliable electricity, resulting in a higher willingness to pay for better service corresponding to reliable electricity (45, 15.68%). Additionally, 232 respondents (80.84%) have not received prior outage notifications and are more willing to pay extra. Power interruptions affect 194 respondents (67.60%) in general activities, 117 (40.77%) in indoor/sports activities, 175 (60.98%) in religious activities, and 145 (51.22%) in cultural activities. Overall, 173 respondents (60.28%) are willing to pay extra for better electricity service, while 114 (39.72%) are not willing to pay for improved electricity service.

Table 2. Demographic Information

Variables		Frequency	Percentage (%)
Gender	Female	75	26.13
	Male	212	73.87
Reliability	Not reliable	242	84.32
	Reliable	45	15.68
Notification	No	232	80.84
	Yes	55	19.16
Effectiveness	No	93	32.40
	Yes	194	67.60
Willingness to pay	No	114	39.72
	Yes	173	60.28
Social activities	No	170	59.23
	Yes	117	40.77
Religious activities	No	112	39.02
	Yes	175	60.98
Cultural activities	No	140	48.78
	Yes	147	51.22

Note: Author's survey 2020

4.2 Socioeconomic Features

The socioeconomic survey presented by data in table 3 shows considerable variability across several measures. The mean WTP is 1264.46, with high variance and a right-skewed distribution (skewness: 5.746) and heavy tails (kurtosis: 53.496). Education levels average 6.254 with low variability, a left-skewed distribution (skewness: -1.764), and more extreme values (kurtosis: 6.772). Household size averages 7.526, showing moderate variability and a right-skewed, leptokurtic distribution (skewness: 2.346; kurtosis: 13.956). The mean income is 115,970.4 with high disparity, right-skewed distribution (skewness: 2.896), and extreme values (kurtosis: 12.336). Monthly bills average 6151.568 with substantial variability, exhibit right-skewed distribution (skewness: 1.789), and frequent extremes (kurtosis: 5.428). While the cost of damage averages 13,959.58 with significant variability, right-skewed distribution (skewness: 3.117), and numerous extremes (kurtosis: 18.796).

Table 3. Socioeconomic Details

Variable	Mean	Variance	Std. Dev	Skewness	Kurtosis
Maximum WTP	1264.46	4894677	2212.392	5.746	53.496
Education	6.254	1.841	1.357	-1.764	6.772
Household Size	7.526	13.075	3.616	2.346	13.956
Income	115970.4	1.81e+10	134514	2.896	12.336
Monthly bill	6151.568	3.71e+07	6093.564	1.789	5.428
Cost of damage	13959.58	5.38e+08	23201.27	3.117	18.796

Note: Author's survey 2020

4.3 Association of Electricity Attributes and Willingness to Pay

The person's chi-square and likelihood chi-square tests determine the association between them. Chi-square tests show no significant association between willingness to pay (WTP) for improved electricity and gender, reliability, prior notification, or effectiveness. As shown in table 4, among respondents, 30 females and 84 males are unwilling to pay extra, while 45 females and 128 males are willing. Being liable to unreliable service, 102 are reluctant, but 173 (140 unreliable, 33 reliable) are willing to pay more. Regarding prior notification, 93 without notice of power outage and 21 with notice exhibit no impact on their WTP, while 173 (139 without notice, 34 with notice) exhibit impact on their WTP. For effectiveness, 114 (44 unaffected, 70 affected) are unwilling, whereas 173 (49 unaffected, 124 affected) are willing to pay more.

Table 4. Willingness to Pay and Electricity Attribute

WTP	Gender		Reliability		Notification		Effectiveness	
	Female "0"	Male "1"	Unreliable "0"	Reliable "1"	No "0"	Yes "1"	No "0"	Yes "1"
No "0"	30	84	102	12	93	21	44	70
	29.8	84.2	96.1	17.9	92.2	21.8	36.9	77.1
Yes "1"	45	128	140	33	139	34	49	124
	45.2	127.8	145.9	27.1	139.8	33.2	56.1	116.9
Total	75	212	242	45	232	55	93	194
	75.0	212.0	242.0	45.0	232.0	55.0	93.0	194.0

Source: Author's Estimation 2020

Table 5 shows no significant association between willingness to pay (WTP) for improved electricity and sports, religious, or cultural activities, as all chi-square test results are below the critical value of 3.84 (α=0.05). For sports activities, 65 respondents are unaffected, and 105 are affected by electricity issues, but this does not impact their WTP. In religious activities, 50 are unaffected, and 64 are influenced, with neither group willing to pay extra. For cultural activities, 61 disagree, and 53 agree that outages affect them without impacting WTP. However, 79 disagree, and 94 agree that interruptions impact their traditional activities and serve as willing to pay extra for improved service.

Table 5. Willingness to Pay and Respondent's Activities

WTP	Sports		Religious		Cultural	
	Disagree "0"	Agree "1"	Disagree "0"	Agree "1"	Disagree "0"	Agree "1"
No "0"	65	49	50	64	61	53
	67.5	46.5	44.5	69.5	55.6	58.4
Yes "1"	105	68	62	111	79	94
	102.5	70.5	67.5	105.5	84.4	88.6
Total	170	117	112	175	140	147
	170.0	117.0	112.0	175.0	140.0	147.0

Source: Author's Estimation 2020

4.4 Results from Binary Logistic Regression

Binary logistic regression shown in table 6 analyzed factors influencing households' willingness to pay (WTP) for improved electricity. The model explains 8.7% of the variation in WTP (Pseudo $R^2 = 0.087$). The Likelihood Ratio (LR) test statistic of 33.47 exceeds the critical value of 21.03 ($\alpha=0.05$), indicating a significant impact from the explanatory variables. Essential factors affecting WTP include household size (positively at 10%), reliability of electricity supply, education level, and monthly income (positively at 5%). Larger households, higher education, and higher income increase WTP, while more reliable electricity supply and higher bills decrease it. Sports activities also significantly influence WTP, with affected households more willing to pay. Factors such as household gender, prior notifications, impacts on religious and cultural activities, and cost of damage are statistically insignificant.

Table 6. Binary Logistic Regression

Willingness to pay (WTP)	Coefficients	Standard Error	P>IZI
Gender of the Household (male=1, female=0)	0.027	0.299	0.929
Household education level	0.220	0.101	0.030
Size of the household	0.066	0.039	0.092
Monthly income of household	3.73e-06	1.50e-06	0.013
Current monthly current bill	-0.00006	0.00003	0.028
Reliability of electricity supply (as reliable)	0.824	0.382	0.031
Prior notification before shortages (yes=1, no=0)	0.206	0.335	0.539
Effect of interrupted electricity (yes=1, no=0)	0.854	0.675	0.206
Sports activities (agree=1, disagree=0)	-0.886	0.352	0.012
Religious activities (agree=1, disagree=0)	-0.042	0.586	0.942
Cultural activities (agree=1, disagree=0)	0.401	0.430	0.352
Cost of damage	7.07e-06	7.11e-06	0.320
Constant	-2.079	0.798	0.009

Log likelihood	-176.091	
LR Chi2 (12)	33.47	
Pseudo R2	0.0868	

*Significant at 10% **Significant at 5%   ***Significant at 1%

Source: Author's Estimation, 2020

4.5 Odds Ratio of Binary Logistic Regression

An odds ratio (OR) quantifies the strength of the association between exposure and outcome. It compares the odds of an outcome occurring with the exposure to the odds without it. An OR of 1 indicates no association; an OR more significant than 1 suggests a positive association (higher odds with exposure), while an OR less than 1 indicates a negative association (lower odds with exposure). Table 7 displays the odds ratios for various factors influencing households' willingness to pay (WTP) for improved electricity service. Males are 1.014 times more likely to pay extra compared to females. Each additional level of education increases WTP by 1.246 times, while a unit increase in household size raises WTP by 1.068 times. Monthly income shows no significant impact (OR = 1.000), and a higher electricity bill slightly decreases WTP (OR = 0.999). Reliable electricity strongly increases WTP (OR = 2.280), and receiving prior outage notifications increases WTP by 1.228 times. Those affected by service interruptions are more likely to pay for improvements (OR = 2.349). In contrast, those affected by sports or indoor activities are less likely (OR = 0.412), with slight inverse effects for religious activities (OR = 0.958) and positive effects

for cultural activities (OR = 1.493). Economic loss from interruptions does not significantly affect WTP (OR = 1.000).

<p align="center">Table 7.   Estimating Odds Ratio of Binary Logistic Regression</p>

Willingness to pay (WTP)	Odds Ratio	Standard Error	P>|Z|
Gender of the Household (male=1, female=0)	1.027	0.308	0.929
Household education level	1.246	0.126	0.030
Size of the household	1.068	0.042	0.092
Monthly income of household	1.000	1.50e-06	0.013
Current monthly current bill	0.999	0.00003	0.028
Reliability of electricity supply (as reliable)	2.280	0.872	0.031
Prior notification before shortages (yes=1, no=0)	1.228	0.411	0.539
Effect of interrupted electricity (yes=1, no=0)	2.349	1.585	0.206
Sports activities (agree=1, disagree=0)	0.412	0.145	0.012
Religious activities (agree=1, disagree=0)	0.958	0.562	0.942
Cultural activities (agree=1, disagree=0)	1.493	0.642	0.352
Cost of damage	1.000	7.11e-06	0.320
Constant	0.125	0.099	0.009

Source: Author's Estimation 2020

4.6 Marginal Analysis of Binary Logistic Regression

Marginal effects measure how explanatory variables change the probability of willingness to pay (WTP) for improved electricity service, holding other variables constant. Table 8 shows that females have a 62% predicted probability of WTP, while males have a 63% probability. For electricity reliability, a 1% improvement in reliability increases the possibility of WTP by 76%, whereas a 1% increase in unreliability raises it by 58%. Not receiving prior notice increases WTP probability by 61%, while receiving notice raises it by 66%. A 1% increase in effectiveness for regular outages raises WTP probability by 68% for those affected, compared to 48% for those unaffected. For sports or indoor activities, those affected have a 70% probability increase, while those unaffected have a 47% increase. For religious activities, affected individuals have a 62% increase in probability, and unaffected individuals have a 61% increase. Cultural activities show a 66% increase in chance for affected individuals and a 57% increase for those unaffected.

<p align="center">Table 8. Estimating Marginal Effect of Categorical Variables of Binary Logistic Regression</p>

Willingness to pay (WTP)	Margins	Standard Error	P>|Z|
Gender of the Household			
Female	0.615	0.608	0.000
Male	0.621	0.036	0.000
Reliability of electricity supply			
As not reliable	0.588	0.034	0.000
As reliable	0.765	0.064	0.000
Prior notification before shortages			
No	0.610	0.035	0.000
Yes	0.658	0.068	0.000
Effect of interrupted electricity			
No	0.477	0.117	0.000
Yes	0.682	0.056	0.000
Sports activities			

No	0.491	0.059	0.000
Yes	0.700	0.043	0.000
Religious activities			
No	0.616	0.062	0.000
Yes	0.626	0.089	0.000
Cultural activities			
No	0.570	0.062	0.000
Yes	0.664	0.056	0.000

Source: Author's Estimation 2020

Table 9 presents the marginal effects of education levels on households' willingness to pay (WTP) for improved electricity service. Education levels range from 1 (uneducated) to 8 (highly educated). The average marginal effect on WTP starts at 0.352 for uneducated households and increases incrementally, reaching 0.685 for households with higher education. It means that as education levels rise, the predicted probability of WTP for improved electricity services increases from 35.2% to 68.5%. Thus, higher education levels significantly boost households' willingness to pay for better electricity services.

Table 9. Estimating Marginal Effect of Education

	Delta –method Margins	Standard Error	P>lZl
_at			
1	0.352	0.110	0.001
2	0.398	0.095	0.000
3	0.446	0.077	0.000
4	0.494	0.057	0.000
5	0.544	0.039	0.000
6	0.593	0.028	0.000
7	0.639	0.032	0.000
8	0.685	0.044	0.000

Source: Author's Estimation 2020

Table 10 presents the marginal effects of households' monthly electricity bills on their willingness to pay (WTP) for improved electricity services, with increments of 1,500. For a bill of 500, the marginal effect on WTP is 0.667, meaning a 1% increase in the bill raises the predicted probability of WTP by 66.7%. As the bill increases to 2,000, the marginal effect drops to 0.649, while for a bill of 14,000, it further decreases to 0.498. It indicates that higher monthly bills reduce the likelihood of households paying more for improved electricity services.

Table 10. Estimating Marginal Effect of Monthly Electricity Bill

	Delta -method Margins	Standard Error	P>lZl
_at			
1 (500)	0.667	0.037	0.000
2 (2000)	0.649	0.032	0.000
3 (3500)	0.631	0.029	0.000
4 (5000)	0.613	0.027	0.000
5 (6500)	0.594	0.027	0.000
6 (8000)	0.575	0.029	0.000
7 (9500)	0.556	0.034	0.000
8 (1100)	0.536	0.040	0.000
9 (12500)	0.517	0.047	0.000

10 (14000)	0.498	0.054	0.000

Source: Author's Estimation 2020

Table 11 shows the marginal effects of monthly income on households' willingness to pay (WTP) for improved electricity services, with increments of 100,000. For a household with an income of 10,000, the marginal effect on WTP is 0.5265, meaning a 1% income increase raises the predicted probability of WTP by 52.65%. When income rises to 110,000, the marginal effect increases to 0.604, indicating a 60.4% increase in the probability of willing to pay. It suggests that higher monthly income makes households more likely to pay for better electricity services.

Table 11. Estimating Marginal Effect of Monthly Income of Household

	Delta –method Margins	Standard Error	P>IZI
_at			
1 (10000)	0.519	0.043	0.000
2 (110000)	0.602	0.028	0.000
3 (210000)	0.679	0.039	0.000
4 (310000)	0.749	0.057	0.000
5 (410000)	0.809	0.067	0.000
6 (510000)	0.857	0.070	0.000
7 (610000)	0.896	0.067	0.000
8 (710000)	0.925	0.060	0.000
9 (810000)	0.947	0.051	0.000
10 (910000)	0.962	0.042	0.000

Source: Author's Estimation 2020

Table 12 shows the marginal effects of household size on willingness to pay (WTP) for improved electricity services, with increments of 4. For a household size of 2, the marginal effect on WTP is 0.524, meaning a 1% increase in household size raises the predicted probability of WTP by 52.4%. When household size increases to 6, the marginal effect is 0.528, slightly raising the probability by 52.8%. This indicates that larger household sizes slightly increase the likelihood of paying more for better electricity services.

Table 12. Estimating Marginal Effect of Size of Household

	Delta –method Margins	Standard Error	P>IZI
_at			
1 (2 persons)	0.524	0.055	0.000
2 (6 persons)	0.583	0.030	0.000
3 (10 persons)	0.639	0.035	0.000
4 (14 persons)	0.694	0.057	0.000
5 (18 persons)	0.743	0.078	0.000
6 (22 persons)	0.787	0.093	0.000
7 (26 persons)	0.826	0.101	0.000
8 (30 persons)	0.859	0.104	0.000
9 (34 persons)	0.887	0.102	0.000

Source: Author's Estimation 2020

4.7 Discussion

Energy is crucial for daily life and economic development, with electrical energy playing a central part in regulation of our day-to-day activities. In Pakistan, electricity is provided by WAPDA, K-Electric, and independent power producers (IPPs), with a total installed capacity of 41,000 MW. It includes hydel (25.8%), thermal (58.8%), nuclear (8.6%), and renewables (6.8%) energy resources. Recent developments, such as Thar coal projects and renewable energy initiatives like solar and wind, aim to boost renewables in the power mix. Despite these efforts, Pakistan faces challenges like load shedding, circular debt, and inadequate infrastructure, impacting economic growth and living standard. The study investigates households' willingness to pay (WTP) for reliable electricity using the Random Utility Model (RUM) and contingent valuation method. Data from 287 households in Tehsil Nowshera showed that 84.32% of respondents had inconsistent energy and were willing to pay more for changes. Key factors positively influencing this attitude included household size, education level, income, and the reliability of power service, all consistent with findings from other studies.

Taale and Kyeremeh (2016) and Twerefou (2014) discovered that education, income, and household size all have a significant impact on willingness to pay (WTP) for reliable electricity in Ghana, echoing the positive correlation between higher education and income levels and a higher likelihood of paying more for improved electricity observed in Nowshera.Ozbafli and Jenkins (2015) found that families are willing to pay higher electricity rates for better reliability, underlining the economic benefits of such upgrades. This finding is consistent with the current study, demonstrating that reliable electricity considerably impacts WTP. However, the variability in WTP explained by the model was restricted to 8.7%, implying that additional unknown factors may be significant. The literature repeatedly emphasizes the role of socioeconomic factors in influencing WTP for improved electrical services. Adjei-Mantey (2013) and Babawale and Awosanya (2014) discovered that income, household size, and education levels significantly impact WTP, mainly when inconsistent electricity drives people to rely on self-generation. However, the effect of monthly bills on WTP is unclear, as larger bills may discourage extra payments for higher services.

The study also looked at the impact of other activities on WTP and discovered that cultural activities had a beneficial influence, whilst sports and religious activities had a detrimental and adverse effect. This conclusion differs from the broader literature, in which the importance of specific activities on WTP is less commonly highlighted, implying that these variables may be more context-dependent. Finally, the study emphasizes the importance of improved infrastructure and stable electrical supply, a recurring subject in the literature. Ozbafli and Jenkins (2015) and Gunatilake et al. (2013) highlight the economic benefits and consistent WTP across income groups for reliable electricity, particularly in rural areas, lending support to the study's findings that larger households with higher incomes and better education are more likely to pay for improved services.

4.8 Implications of the Study

The study's findings have several substantial implications. Policymakers should emphasize increasing power dependability and reducing socioeconomic gaps to boost households' willingness to pay (WTP) for better services. Raising public knowledge of renewable energy and its benefits can also help WTP and sustain the shift to cleaner energy sources.

Furthermore, deliberate government interventions, such as targeted expenditures and effective pricing regulations, are critical to encouraging renewable energy adoption and assuring a sustainable future.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study aims to identify the factors influencing households' willingness to pay extra for improved, reliable electricity services. It also examines the impact of sports, religious, cultural, and social activities on this willingness. Data were collected from 287 households in Nowshera using the contingent valuation method. It investigated the numerous elements affecting households' willingness to pay (WTP) for enhanced electricity services and the adaptation of renewable energy sources. The data showed the substantial impact of socioeconomic parameters such as income, education level, household size, and electrical reliability on WTP. Higher education, income levels and larger household sizes are directly linked to a greater tendency to pay for improved electrical services. Furthermore, homes with inconsistent electricity supply and frequent power outages demonstrated a higher WTP for upgrades.

Environmental awareness and attitudes towards renewable energy also influenced customer preferences. The study discovered that economic variables especially price significantly influence raising awareness and marketing of the benefits of green energy. This could ultimately improve WTP for renewable energy sources. Therefore, obstacles like high costs, lack of knowledge, and institutional impediments must be overcome to encourage widespread usage.

Furthermore, the study found that factors such as advance notification of power outages, the impact of power interruptions on everyday activities, and government measures significantly affect WTP. According to the study, households are more likely to pay for reliable electricity when they see tangible benefits, such as uninterrupted power for critical activities. However, gender and specific cultural or religious activities have little effect on WTP. It also stressed the significance of government involvement in promoting renewable energy and strengthening power infrastructure. Strategic investments, effective pricing strategies, and public awareness initiatives are critical for promoting a sustainable and reliable energy sector. According to the study, targeted policies particularly those that improve renewable energy education and address economic inequities have the potential to raise WTP and help the transition to greener energy options.

In conclusion, this study emphasizes the complexities of the factors influencing families' willingness to pay for enhanced electrical services and renewable energy adoption. By addressing economic and environmental issues and raising public knowledge, policymakers can establish methods that link consumer preferences with sustainable energy goals, resulting in a more reliable and ecologically friendly electricity supply.

5.2 Policy Recommendations

Based on the findings, the following recommendations are made for policy consideration. The government should actively promote renewable energy policies to cater to both the supply and demand sides, using information campaigns to encourage the use of renewable resources. Investment in power sector infrastructure is crucial, particularly in replacing outdated power plants to enhance efficiency and

reduce generation costs, thereby improving service reliability and consumer satisfaction, which could increase their willingness to pay higher tariffs. Policies should prioritize replacing imported crude oil with domestically abundant coal for thermal power plants and encourage the extraction of natural resources. Enhancing education and income levels is essential, as educated individuals are more likely to appreciate and pay for better electricity services. Additionally, creating a favorable environment for small and large-scale investors by reducing loan interest rates can boost commercial activities and household incomes. This will increase their willingness to pay for reliable electricity. Conducting pilot studies in diverse regions through public-private partnerships can provide valuable insights for optimal electricity supply development.

6. LIMITATIONS AND FUTURE STUDIES

The study also has a few limitations. Firstly, the sample size may need to reflect the larger population. Therefore, the findings' generalizability has become inconclusive speculating the inclusion of other variables or factors to discern results that can be accurately applied to the rest of the population holistically. Secondly, the study depends on self-reported data, which may be liable to biases. Thirdly, the study focuses on a specific geographical region, which may limit the results' application to other areas with diverse socioeconomic or cultural backgrounds. Finally, external factors such as government regulations or market dynamics may affect households' willingness to pay. Considering these limitations, the researchers propose future studies that can incorporate these factors which could be thoroughly examined.

REFERENCES

Adjei-Mantey, K. (2013). *Households' willingness to pay for improved electricity supply in the accra-tema metropolitan areas* [Doctoral dissertation, University of Ghana]. IHSN. http://ugspace.ug.edu.gh.

Adnan, M., Mukhtar, A., & Asif, M. (2023). Linkage between energy security and foreign policy options: Way forward for Pakistan. *Journal of Positive School Psychology*, 7(4), 704-724. https://openurl.ebsco.com/EPDB%3Agcd%3A10%3A14453962/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A163977468&crl=f

Ahmad, M., Beddu, S., Itam, Z. B., & Alanimi, F. B. I. (2019). State of the art compendium of macro and micro energies. *Advances in Science and Technology. Research Journal*, *13*(1), 88-109. https://doi.org/10.12913/22998624/103425

Ali, H., & Nawaz, M. (2013). Energy crisis and productive inefficiency: Micro-evidence from textile sector of Faisalabad. *The Pakistan Development Review*, 52(4I), 447-465. https://doi.org/10.30541/v52i4Ipp.447-465

Alinsato, A. S. (2015). Economic valuation of electrical service reliability for households' in developing country: A censored random coefficient model approach. *International Journal of Energy Economics and Policy*, *5*(1), 352-359. https://www.econjournals.com/index.php/ijeep/article/view/1050

Anwar, T., & Saeed, K. (2023). Energy crisis of Pakistan: Analyzing governance issues. *Journal of Contemporary Macroeconomic Issues*, *4*(2), 39-51. https://ojs.scekr.org/index.php/jcmi/article/view/116

Aweke, A. T. (2018). *External cost of electricity in Northern Ethiopia: Households' willingness to pay to avoid blackouts and environmental costs of windfarms* [Master's thesis, Norwegian University of Life Sciences]. NMBU. http://hdl.handle.net/11250/2558254

Babawale, G. K., & Awosanya, A. O. (2014). Estimating household willingness to pay for improved electricity supply in Lagos metropolis. *British Journal of Economics, Management and Trade*, *4*(5), 672-693. https://doi.org/10.9734/BJEMT/2014/5396

Bösche, A. (2016). *The Chinese consumers' attitudes towards their "willingess to pay" for renewable electricity: An analysis of economic and environmental factors* [Master's Thesis, LUND University]. Grin Verlag. www.ehl.lu.se

Cust, J., Singh, A., & Neuhoff, K. (2007). *Rural electrification in India: Economic and institutional aspects of renewables.* [Working Paper No. 2760810, University of Cambridge]. Energy Policy Research Group. https://doi.org/10.2139/ssrn.2760810

Daneshvar, M., Razavi Hajiagha, S. H., Tupėnaitė, L., & Khoshkheslat, F. (2020). Effective factors of implementing efficient supply chain strategy on supply chain performance. *Technological and Economic Development of Economy, 26*(4), 947-969. https://doi.org/10.3846/tede.2020.12827

David, L. S. (2014). *Drivers of consumers' willingness to pay for green electricity and remarks on information policies* [Master's Thesis, University of Helsinki]. Helda.
https://helda.helsinki.fi/server/api/core/bitstreams/cba63988-29a5-4c99-bcef-0531accca7a4/content

De Nooij, M., Koopmans, C., & Bijvoet, C. (2007). The value of supply security: The costs of power interruptions: Economic input for damage reduction and investment in networks. *Energy Economics*, *29*(2), 277-295. https://doi.org/10.1016/j.eneco.2006.05.022

Duffy, P. A., Hite, D., Bransby, D., & Slaton, C. (2007). Consumer willingness-to-pay for green energy: Results from focus groups. In *Proceedings of the 2007 Annual Meeting of the Southern Agricultural Economics Association* (pp. 1-19). Research in Agricultural and Applied Economics. https://doi.org/10.22004/ag.econ.34913

Farhar-Pilgrim, B. (1999). *Willingness to pay for electricity from renewable resources: A review of utility market research (1st Edition)*. National Renewable Energy Laboratory. https://www.aceee.org/files/proceedings/1996/data/papers/SS96_Panel9_Paper08.pdf

Government of Pakistan Finance Division. (2023). *Highlights of Pakistan economic survey 2022-2023*. Associated Press of Pakistan. https://www.finance.gov.pk/survey/chapter_23/Highlights.pdf

Graber, S., Narayanan, T., Alfaro, J., & Palit, D. (2018). Solar microgrids in rural India: Consumers' willingness to pay for attributes of electricity. *Energy for Sustainable Development*, *42*, 32-43. https://doi.org/10.1016/j.esd.2017.10.002

Gunatilake, H., Maddipati, N., & Patil, S. (2013). Willingness to pay for electricity supply improvements in rural India. *Journal of Resources, Energy and Development*, *10*(2), 55-78. https://doi.org/10.3233/RED-120104

Gupta, A., Kumawat, S., & Garg, S. (2016). Automatic plant watering system. *Imperial Journal of Interdisciplinary Research (IJIR)*, *2*(4), 1123-1127. http://www.onlinejournal.in

Ifat, M. (2018). *Domestic energy poverty and willingness to pay for alternative energy: The case of Pakistan* [Doctoral dissertation, Sabanci University]. Sabanci University Research Database. http://risc01.sabanciuniv.edu/record=b1819808

Jung, W. J., Kim, T. H., & Lee, S. Y. T. (2015). Contingent valuation method of new and renewable energy as a future alternative in Korea. *International Journal of Bio-Science and Bio-Technology*, *7*(3), 283-292. https://doi.org/10.14257/ijbsbt.2015.7.3.30

Kamal, W. (2022, March 16). Energy crisis in Pakistan— Electricity transmission and distribution analysis. *Scientia Magazine*. https://scientiamag.org/energy-crisis-in-pakistan-electricity-transmission-and-distribution-analysis/

Kamran, M., Mudassar, M., Abid, I., Fazal, M. R., Ahmed, S. R., Abid, M. I., Khalid, R., & Anjum, S. H. (2019). Reconsidering the power structure of Pakistan. *International Journal Renew. Energy Res*, *9*(1), 480-492. https://www.ijrer.org/ijrer/index.php/ijrer/article/view/8954

KPITB. (n.d.). *About Khyber Pakhtunkhwa*. Government of Khyber Pakhtunkhwa. https://kp.gov.pk/page_type/message/page/welcome

Lancaster, K. J. (1966). A new approach to consumer theory. *Journal of political economy*, *74*(2), 132-157. https://doi.org/10.1086/259131

Ma, C., Rogers, A. A., Kragt, M. E., Zhang, F., Polyakov, M., Gibson, F., Pandit, R., & Tapsuwan, S. (2015). Consumers' willingness to pay for renewable energy: A meta-regression analysis. *Resource and Energy Economics*, *42*, 93-109. https://doi.org/10.1016/j.reseneeco.2015.07.003

Malik, A. (2023). Local coal for power generation in Pakistan (Report No. 2023:103). In *The Pakistan Development Review, 62*(4), 573-589. https://doi.org/10.30541/v62i4573-589.

Masroor, F., Ashfaq, M., Siddiqui, M., Hussain, M. M., Shahbaz, M. H., Sadeghi, M. K., & Saeed, G. A. B. (2021). The Power Sector of Pakistan: A Brief Review. *Systemic Total*, *121*, 35735. https://ieec.neduet.edu.pk/2021/papers_2021/IEEC_2021_41.pdf

McFadden, D. (2001). Economic choices. *American Economic Review*, *91*(3), 351-378. https://doi.org/10.1257/aer.91.3.351

Niu, S., Jia, Y., Ye, L., Dai, R., & Li, N. (2016). Does electricity consumption improve residential living status in less developed regions? An empirical analysis using the quantile regression approach. *Energy*, *95*, 550-560. https://doi.org/10.1016/j.energy.2015.12.029

Nkosi, N. P. (2016). *South Africans' willingness to pay for renewable and nuclear energy to avoid power outages*. [Doctoral dissertation, University of Johannesburg]. ProQuest Dissertations & Theses.

Ntanos, S., Kyriakopoulos, G., Chalikias, M., Arabatzis, G., & Skordoulis, M. (2018). Public perceptions and willingness to pay for renewable energy: A case study from Greece. *Sustainability*, *10*(3), 687-703. https://doi.org/10.3390/su10030687

Oseni, M. O. (2017). Self-generation and households' willingness to pay for reliable electricity service in Nigeria. *The Energy Journal*, *38*(4), 165-194. https://doi.org/10.5547/01956574.38.4.mose

Ozbafli, A., & Jenkins, G. P. (2015). The willingness to pay by households for improved reliability of electricity service in North Cyprus. *Energy Policy*, *87*, 359-369. https://doi.org/10.1016/j.enpol.2015.09.014

Pasha, H. A., & Saleem, W. (2013, December). The impact and cost of power load shedding to domestic consumers. In *Proceedings of the 29th Annual General Meeting and Conference of the Pakistan Society of Development Economists* (pp. 355-372). Pakistan Institute of Development Economics. https://www.jstor.org/stable/24397898

Qasim, M., & Kotani, K. (2014). An empirical analysis of energy shortage in Pakistan. *Asia-Pacific Development Journal*, *21*(1), 137-166. https://doi.org/10.18356/df0bf4ec-en

Qudrat-Ullah, H. (2015). Independent power (or pollution) producers? Electricity reforms and IPPs in Pakistan. *Energy*, *83*, 240-251. https://doi.org/10.1016/j.energy.2015.02.018

Shih, L. H., & Chou, T. Y. (2011). Customer concerns about uncertainty and willingness to pay in leasing solar power systems. *International Journal of Environmental Science & Technology*, *8*, 523-532. https://doi.org/10.1007/BF03326238

Sibtain, M., Li, X., Bashir, H., & Azam, M. I. (2021). Hydropower exploitation for Pakistan's sustainable development: A SWOT analysis considering current situation, challenges, and prospects. *Energy Strategy Reviews*, *38*, 100728. https://doi.org/10.1016/j.esr.2021.100728

Streimikiene, D., & Mikalauskiene, A. (2014). Lithuanian consumer's willingness to pay and feed-in prices for renewable electricity. *Amfiteatru Economic Journal*, *16*(36), 594-605. https://hdl.handle.net/10419/168846

Strielkowski, W., Civín, L., Tarkhanova, E., Tvaronavičienė, M., & Petrenko, Y. (2021). Renewable energy in the sustainable development of electrical power sector: A review. *Energies*, *14*(24), 8240. https://doi.org/10.3390/en14248240

Taale, F., & Kyeremeh, C. (2016). Households′ willingness to pay for reliable electricity services in Ghana. *Renewable and Sustainable Energy Reviews*, *62*, 280-288. https://doi.org/10.1016/j.rser.2016.04.046

Twerefou, D. K. (2014). Willingness to pay for improved electricity supply in Ghana. *Modern Economy*, *5*(5), 489-498. https://doi.org/10.4236/me.2014.55046

Unwin, J. (2019). *What does Pakistan's energy mix look like and what is its future.* Power Technology. https://www.power-technology.com/features/pakistan-energy-mix/

Ward, D. O. (2010). *Consumers' willingness to pay for energy labels on household appliances* [Master's thesis, University of Tennessee]. TRACE. https://trace.tennessee.edu/utk_gradthes/669

Williams, G. (2012). Are consumers' willing to pay extra for the electricity from renewable energy sources? An example of Queensland, Australia. *International Journal of Renewable Energy Research, 2*(4), 758-766. http://www.ijrer.org/index.php/ijrer/article/view/387/pdf

World Economic Forum. (2019, September 24). *A new dawn approaches for Pakistan's troubled energy sector.* https://www.weforum.org/agenda/2019/09/a-new-dawn-approach-for-pakistan-trouble-energy-sector/

Yang, Y., Liu, Z., Saydaliev, H. B., & Iqbal, S. (2022). Economic impact of crude oil supply disruption on social welfare losses and strategic petroleum reserves. *Resources Policy*, *77*, 102689. https://doi.org/10.1016/j.resourpol.2022.102689

Appendix 1: Questioner

Willingness to pay for the Reliable and Uninterrupted Electricity Supply in district Nowshera

The questioner is based on people willingness to pay for the uninterrupted electricity supply to their home. Objective of the study is to determine the factors that influence their willingness to pay additional amount for improved electricity supply service and also the impact on social and cultural activities due to electricity outages on respondent's willingness to pay an additional amount for better electricity services.

Demographic Factors:

Age of respondent _____   Gender   _____

Education   _____   Profession   _____

Type of home ownership   _____

Q1: How many individuals are there in this household?   _____

Q2: How many of them are working?   _____

Q3: Do you have any other job besides your main occupation? If yes, what is it?

Q4: What is your total monthly income? i.e. The sum of monthly incomes of all persons who are working in this house. Rs._____

Q5: How many hours does it take on average when power goes off (on days that it does)?

_____

Q6: How many units of electricity do you consume during every month?   _____

Q7: On average, how much do you pay for electricity service on monthly base?

Rs. _____

Q8: What is your alternative source of power when electricity goes off?
  1. Generator **2.** Solar energy **3.** Torch light **4.** Gas lights **5.** No alternative (specify)

_____

Q9: On average, how much do you spend on this alternative source of power during power outages in a month?

Q10: How necessary do you consider the current supply of electricity an issue worth discussing?
  1. Extremely necessary **2.** Very necessary **3.** Necessary **4.** Moderately Necessary **5.** Not Necessary

Q11: How would you rank the reliability of current supply of electricity to your home/ neighborhood?
  1. Reliable **2.** Not reliable

Q12: How would you rank the quality (complete level of voltage) of current supply of electricity to your home/ neighborhood?
  1. Excellent **2.** Very good **3.** Good **4.** Poor **5.** Very poor

Q13: Have you experienced any damages due to low quality and unreliable electricity supply?
  1. Yes   **2.** No

If yes then mentioned, how much the cost was? Rs   _____

Q14: Have you ever experienced the prior notification given before an outage of current supply of electricity to your home?
  1. Yes   **2.** No

Q15: Are you sensitive about the electricity?
  1. Yes   **2.** No

Q16: Do you think the appropriate authorities have done enough to solve or at least deal with the problems of providing reliable and quality electricity supply?

1. Yes   **2.** No

Q17: Will you be willing to pay higher for the improvement (uninterrupted supply) of this electricity service?

   1. Yes   **2.** No

Q18: How much you will be willing to pay higher for the uninterrupted supply of this service per month?

Q19: Have you ever been affected from interrupted electricity supply? ——————————————

   1. Yes   **2.** No

If yes, then specify the following:

	Agree	Disagree
Sports		
Religious		
Cultural		

Q20: Who is responsible for the current power outages?

   1. Government   **2.** Myself   **3.** Electricity thief

Q21: What would you like to suggest to the government about the issue?

Mobility Assistive Technology (AT) for Children with Cerebral Palsy (CP): A Literature Review

Guanzhou Ren[1] and Rosalam Che Me[1,2*]

[1]Department of Industrial Design, Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang 43400, Malaysia

[2]Malaysian Research Institute on Ageing (MyAgeing), Universiti Putra Malaysia, Serdang 43300, Malaysia

Article Information	ABSTRACT
Article Type: Research Article **Dates:** **Received:** August 28, 2024 **Revised:** October 02, 2024 **Accepted:** October 08, 2024 **Available online:** October 13, 2024 **Copyright:** *This work is licensed under Creative Commons, licensed ©2024.* **Corresponding Author:** Rosalam Che Me rosalam@upm.edu.my https://orcid.org/0000-0001-9507-6056	

This paper comprehensively reviews mobility assistive technology (MAT) use in children with Cerebral Palsy (CP). Currently, 9 million people are severely affected by CP, the most serious form of movement disability, characterised by deficits in movement, posture, and more, alongside cognitive and sensory deficits. These impairments restrict the child's functionality in self-care, performing tasks associated with daily living, and socialisation. The primary purpose of this paper is to establish the role of MAT in supporting children with CP and assess its impact on their lives. This review describes a range of devices that enhance mobility in motor-disabled patients, such as powered wheelchairs, robotic exoskeletons, ankle-foot orthoses (AFO), and gait trainers. It examines their effects on the psychosocial well-being and physical growth of children with CP. A methodical search within the PRISMA framework enabled us to analyse papers from 2010 to 2024, discussing the advantages and disadvantages of assistive technology (AT). It was noted that although ATs can improve independence, social involvement, and mobility, challenges such as high costs, poor design, and unavailability of these resources in underprivileged regions remain. New information technologies, including intelligent systems and virtual reality (VR) training tools, effectively address health-related issues; however, optimising these techniques over a long period needs further study. This paper underscores the importance of a more child-centred design of AT devices and additional policy adjustments to enhance accessibility across different socio-economic strata. Through this review, we seek to advance the emerging understanding of the role of mobility AT in enhancing the lives of children with CP, focusing on identifying weaknesses in the existing research and suggesting possible advancements.

Keywords: Cerebral Palsy; Mobility Assistive Technology; Powered Wheelchairs; Robotic Exoskeletons; Ankle-Foot Orthoses; Gait Trainers; Virtual Reality

1. INTRODUCTION

Children's mobility impairments can arise from various causes, such as diseases, trauma, or congenital defects, including conditions like spina bifida, arthritis, and other motor disabilities. Cerebral Palsy (CP) is the most prevalent motor disability in children. CP is a group of disorders affecting movement and posture, with a global prevalence of 2-3 cases per 1,000 live births (Candiotti et al., 2019).

Children diagnosed with CP often suffer from a range of related conditions, such as abnormal muscle tone, poor motor coordination, and muscle control, leading to severe physical disabilities. Additionally, complications like learning disorders, epilepsy, sensory impairments, and spinal deformities further exacerbate their physical limitations (Hamilton et al., 2022). Figure 1 highlights various assistive technology devices (ATDs) that help children with CP engage with their surroundings and communicate effectively. Such devices include essential adaptive tools like enlarged utensil handles and advanced mobility aids like powered wheelchairs.

Figure 1. Examples of Assistive Technology Devices (ATDs) for Children with Cerebral Palsy (Assistive and Adaptive Technology for Children with Cerebral Palsy, May 7, 2022)

Cerebral palsy significantly hinders children's participation in daily activities due to limitations in movement, posture, and functional independence (Hamilton et al., 2022). These difficulties are further aggravated by other diseases or conditions including intellectual deficits, seizures, vision and hearing problems, communicative deficits and scoliosis (Downey & Hurtig, 2003). Mobility assistive technology (MAT) comes into the picture to lessen these difficulties and gives opportunities to children with CP to improve their mobility and independence(Loncke et al., 2017). As presented in Figure 2, augmentative and alternative communication (AAC) and hearing devices enable communicational exchange for nonverbal children.

Figure 2. Augmentative and Alternative Communication and Hearing Devices

A wide variety of Assistive technology devices, such as simple tools to power mobility systems, allow children with CP to carry out activities of daily living more independently than before (Loncke et al., 2017).

They can interact more actively in the classroom and community settings. For instance, powered wheelchairs Figure 3, give users more opportunities for mobility and children with CP can move about and become active members of society and the school. These technologies greatly enhance their living standards as they help reduce the care load for the parents and enhance self-sufficiency.

Figure 3. Powered Wheelchairs and Augmentative and Alternative Communication Devices (Zangari, 2019)

There is no doubt that MAT has advantageous factors. However, some boundaries limit its extensive use (Tegler et al., 2021). It was found that many children with CP do not use appropriate assistive devices because of socioeconomic barriers, poor infrastructure, and child-centred design deficiency (Hornero et al., 2015). This is further exacerbated by insubordinate aids that do not correspond with the chronological age of the targeted child. Therefore, the masons go to great lengths to acquire devices, only to end up in the wrong hands whenever movement occurs (Encarnação & Cook, 2023). Challenges, such as a lack of training for similar caregivers and healthcare professionals, worsen these difficulties, particularly in low/middle-income countries where factors are behind (Bona et al., 2021).

Figure 4. Smart Home Technologies Enabling Mobility for CP Children (Mtshali & Khubisa, 2019)

As highlighted in Figure 4, smart home technologies are emerging as an innovative solution to enable children with CP to control household devices such as lighting and appliances, thereby improving their

autonomy within the home environment. Children affected by CP are, therefore, able to stand and walk, which encourages muscle use without concerns of long-standing complications due to immobility (Bonello et al., 2022). The devices are called robotic exoskeletons. Figure 5 shows the devices, another promising development that aims to assist active development (Poli, 2021).
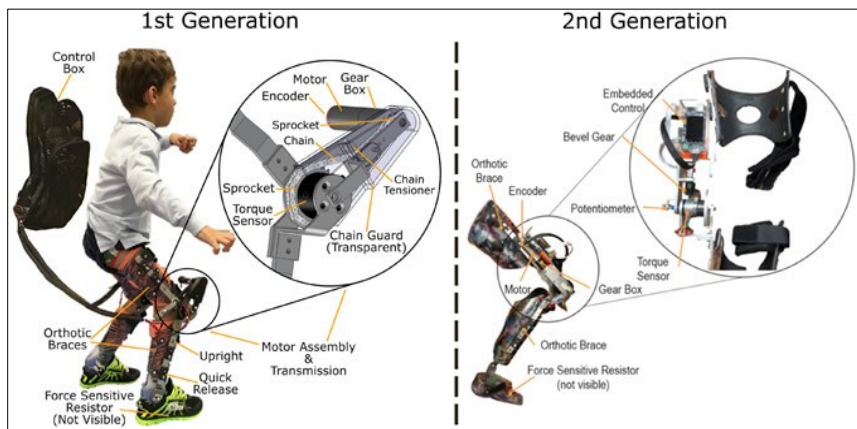
Figure 5. Robotic Exoskeletons for Mobility Assistance (Poli, 2021)

Based on the literature, this paper identified the available MATs, evaluated their usefulness in enhancing the lives of children with CP, and addressed potential gaps in AT delivery that need to be filled. Specifically, the areas where these mobility devices are appropriate will be described, along with the benefits and limitations of different AT techniques. Finally, the challenges affecting the performance of current and future AT interventions for children with CP will be highlighted (Matsuda, 2022). Thus, this paper can contribute to the general body of knowledge on mobility AT use and how these adaptive tools can promote the quality of life for children with CP of any age, focusing on increased independence, social and educational participation, and decreased caregiver burden. Additionally, the paper will consider inequities in utilising ATs across different socio-economic settings, emphasising the need to provide simple and complex ATs to enhance children's mobility with CP (Desouza & Frank, 2016).

MAT has the potential to become a significant factor in improving the lives of children with CP, enabling greater participation in activities at home and school. However, current gaps in the use of ATs, the lack of child-centred approaches, and socio-economic challenges affecting accessibility call for more emphasis on research in this area (Dhas et al., 2014). This paper examined the current state of mobility AT for children with CP, identified existing gaps, and explored promising prospects for enhancing the provision and efficiency of these valuable tools. The objective is to discuss several important aspects of AT that enhance the quality of life for children with CP and their families.

2. METHODOLOGY

According to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework, this systematic review followed a robust and transparent methodology. Data extraction and synthesis were the four phases of the review process, including a strategy for searching, eligibility requirements, data extraction, and data synthesis.

2.1 Search Strategy

Our research used the selected common databases such as Scopus, PubMed, Google Scholar, and Science Direct. The search was conducted from January 2010 to June 2024, focusing on studies related to mobility assistive technologies (MAT) for children diagnosed with cerebral palsy (CP) (Bekteshi et al., 2022). Keywords used in the search process included: "children with cerebral palsy," "mobility impairment," "assistive technology," "powered wheelchair," and "robotic exoskeleton." Boolean operators (AND, OR) were applied to maximise the range of articles identified. No language or region restrictions were applied, but only articles published in peer-reviewed journals were considered (Bekteshi et al., 2023). Grey literature, including conference papers, reports, and non-peer-reviewed articles, was excluded to maintain methodological rigour. A total of 15,982 papers were initially identified across all databases.
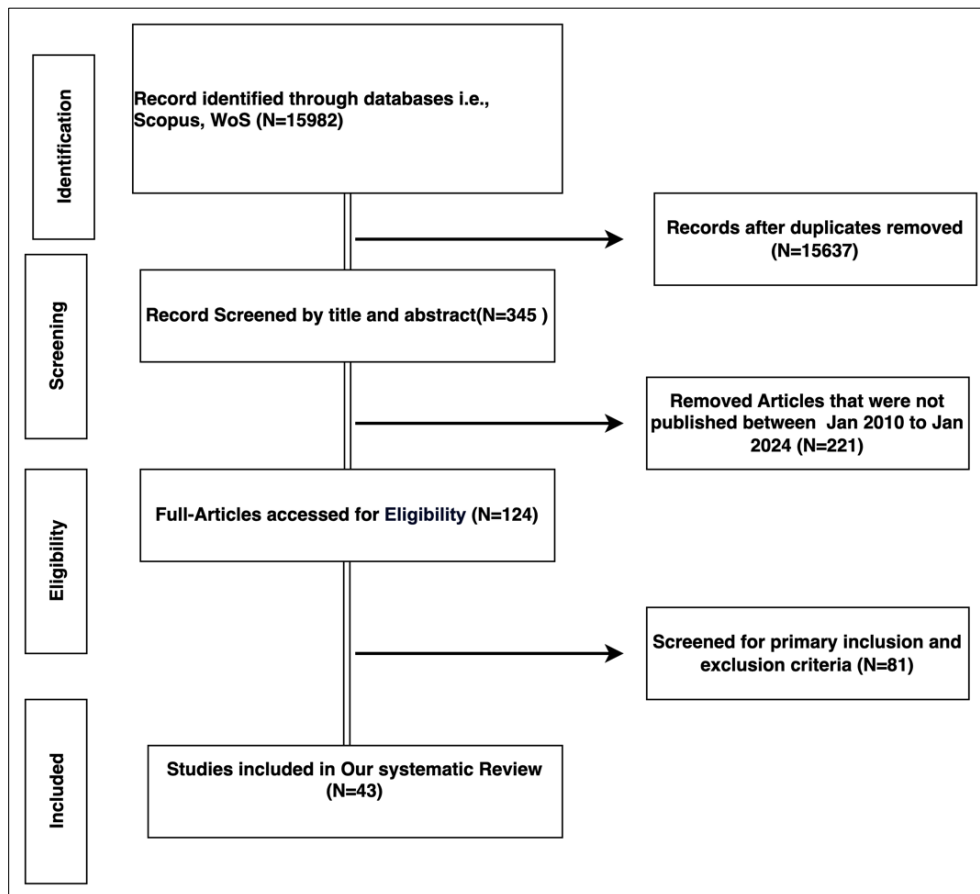
Figure 6. Flowchart of Study Selection Process

Figure 6 shows the number of articles identified, screened, excluded, and finally included in the review. Below is the table representation of the PRISMA Flowchart for the study selection process: Table 1 represents the study selection process for the systematic review following the PRISMA guidelines.

Table 1. PRISMA Flowchart of Study Selection Process

Stage	Description	Number of Articles
Identification	Total studies identified through database searching	15,982
Duplicate Removal	Duplicates removed	15,637
Screening	Studies screened by title and abstract	345
Eligibility	Full-text articles assessed for eligibility	124
Excluded	Articles excluded after full-text assessment	81
Included	Studies included in the systematic review	43

Table 2. Search Strategy Overview

Database	Keywords	Time-frame	Total Results	Relevant Results
Scopus	Children with cerebral palsy AND "AT"	2010-2024	6,800	220
PubMed	"Cerebral palsy" AND mobility impairment	2010-2024	3,000	60
Science Direct	Assistive Technology "AND "children"	2010-2024	4,200	40
Google Scholar	Powered" wheelchairs" OR robotic exoskeleton"	2010-2024	1,982	25

Table 2 summarises the databases and search strategies used to identify relevant studies for the review on mobility assistive technologies (MAT) for children with cerebral palsy (CP). The table outlines the keywords employed, the time frame of the search (2010–2024), and the total number of results retrieved from each database (Luna Lorente et al., 2024). It highlights the efforts to comprehensively search relevant literature across multiple reputable sources such as Scopus, PubMed, Science Direct, and Google Scholar, ensuring the inclusion of high-quality studies. The table also distinguishes between the total results and the relevant studies deemed appropriate for further review based on the defined inclusion criteria (Gusenbauer & Haddaway, 2020).

2.2 Eligibility Criteria

Studies were selected based on predetermined inclusion and exclusion criteria. The inclusion criteria were: (i) studies involving children (aged 0–18) diagnosed with CP, (ii) studies assessing the use of mobility assistive technologies (e.g., powered wheelchairs, exoskeletons, ankle-foot orthoses), (iii) full-text articles available in English, and (iv) studies with quantitative or qualitative data assessing the usability, benefits, or limitations of ATs in improving mobility. We excluded studies that (i) only focused on adult populations, (ii) primarily investigated medical or surgical interventions without AT integration, (iii) lacked a specific focus on motor or mobility impairment in CP, and (iv) were not published in peer-reviewed journals. After removing duplicates, 345 studies were retained for further review.

2.3 Study Selection

The screening process involved two stages: an initial screening of titles and abstracts and a full-text review. Two independent reviewers assessed the relevance of the studies to ensure objectivity and minimise bias. Disagreements between reviewers were resolved through consensus discussions. A total of 124 studies passed the initial screening, and 43 were selected for inclusion in the final analysis after a thorough full-text review.

Table 3. Study Selection

Stage	Number of Studies	Description
Initial search results	15,982	Studies identified through database searches
After duplicate removal	345	Studies remaining after duplicates were removed
Title/abstract screening	124	Relevant studies for full-text review
Full-text review and selection	43	Studies included in the final analysis
Initial search results	15,982	Studies identified through database searches

Table 3 presents a breakdown of the study selection process, detailing each step from the initial search to the final inclusion of studies. Out of 15,982 articles initially identified, duplicates were removed, leaving 345 studies for title and abstract screening. Following a more detailed full-text assessment, 124 studies met the eligibility criteria. Ultimately, 43 studies were included in the final review. This table highlights the rigorous selection process employed to ensure that only the most relevant and high-quality studies were incorporated into the systematic review, following the PRISMA guidelines.

2.4 Thematic Analysis

The review applied thematic analysis to group and analyse data, focusing on key patterns, challenges, and outcomes in implementing MAT for children with CP. A thematic synthesis approach was employed to derive common themes related to effectiveness, usability, and barriers to MAT use. Data were grouped into major categories such as types of assistive technologies, influence on mobility, and barriers to adoption and use. NVIVO software was used to analyse the data and identify the themes through systemic coding.

Identified Themes

Theme1: Effectiveness of Different MAT

This theme explored how powered wheelchairs, robotic exoskeletons, and other devices impacted children's mobility and social integration.

Theme 2: Barriers to MAT Adoption

This theme identified key barriers, including high costs, inadequate customisation, and lack of training, that limit the effectiveness of MAT for children with CP.

Theme 3: Psychosocial Impact of MAT

This theme highlighted the importance of mobility devices' social and emotional aspects, emphasising the need for more socially acceptable designs to reduce stigma.

2.5 Data Extraction

Extraction sheets structured were used in the data extraction process (Pollock et al., 2023). The information extracted included the authors, year of publication, country, study design, sample size, type of mobility assistive technology used, the outcome measures, and key findings on mobility improvements, independence, ease to use, and safety. Assisted technologies were examined while paying attention to the applied use of these technologies to enhance the mobility and participation of children with CP.

Table 4. Data Extraction Summary

Author(s)	AT Type	Sample Size	Outcome Measure
Field et al., (2022)	Powered Wheelchair	25	Usability, Mobility Improvement
Bekteshi et al., (2022)	Ankle-Foot Orthosis	10	Gait Improvement, Usability
Smorenburg et al. (2020)	Robotic Exoskeleton	15	Independence, Safety
Zhang et al., (2023)	Gait Trainer	30	Motor Development, Bone Density
Hossain et al., (2018)	Walkers	12	Balance Improvement, Posture Support
Kakooza-Mwesige et al., (2016)	Ankle-Foot Orthosis	17	Gait and Posture Improvement
Fieremans et al., (2016)	Gait Trainer	15	Motor Control, Gait Improvement
Li et al., (2024)	Ankle-Foot Orthosis	12	Balance and Stability Improvement
Mtshali & Khubisa, (2019)	Robotic Exoskeleton	10	Muscle Strength, Movement Coordination
Candiotti et al., (2019)	Powered Wheelchair	18	Independence, Usability
Hossain et al., (2018)	Walkers	14	Gait Improvement, Usability
Li et al., (2024)	Powered Wheelchair	29	Cognitive Development, Social Integration
Bekteshi et al., (2022)	Robotic Exoskeleton	15	Independence, Safety

Table 4 General characteristics and outcomes of 80 studies of different types of MATS used by children with CP The rows included the authors' names, year of publication, type of assistive technology, number of participants, and the primary outcome measure diversity of interventions.

A powered wheelchair versus a robotic exoskeleton can be seen, and the diversity of MAT interventions is dramatically different (Karami et al., 2023). These impacts directly influence mobility, independence, and, hence, the quality of life in children with CP (Fosch-Villaronga & Drukarch, 2023). Summing it all up will provide an overall view of the current state of the art.

2.6 Data Synthesis

The data was synthesised using a thematic approach and summarised and interpreted using the narrative synthesis of the outcomes from studies included in the report. Meta-analyses were impossible as there existed heterogeneity concerning study design, sample size, and outcome measurements. The studies would be categorised based on the type of assistive technology used; the outcomes, accordingly, would be reported qualitatively. It focuses on identifying patterns in terms of usability and effectiveness, along with challenges in using assistive technologies for mobility for children with CP. Much attention has been paid to the hurdles not leading to optimum usage of the devices, which include technological limitations, cost, and failure to get customised to the needs of pediatric users.

Table 5. Assistive Technologies and Their Reported Benefits

Assistive Technology	Number of Studies	Reported Benefits
Powered Wheelchairs	15	Increased independence, mobility, and participation
Ankle Foot Orthoses	8	Improved gait and posture
Robotic Exoskeletons	10	Enhanced mobility, reduced fatigue
Gait Trainers	5	Support for motor development and walking
Walkers	5	Increased activity, improved bone density

Table 5 presents a comprehensive overview of various assistive technologies (AT) designed for children with cerebral palsy (CP) and their reported benefits. This table categorises technologies such as powered wheelchairs, robotic exoskeletons, ankle-foot orthoses, and gait trainers, highlighting the specific advantages of each device. The benefits include improvements in mobility, independence, social participation, muscle strength, and overall quality of life (Baldelli et al., 2021). By synthesising the reported outcomes from recent studies, this table emphasises the significant role of AT in enhancing functional capabilities and providing supportive interventions for children with CP.

3.0 RESULT & DISCUSSION

This review identified and categorised the findings into three key themes through a thematic analysis of the 43 studies reviewed. These themes capture how MAT promotes efficiency, critical barriers to uptake, and key psychosocial implications of using these technologies among children diagnosed with cerebral palsy (CP). For each theme, peer-reviewed studies focusing on the same topic were used to keep this discussion to a certain level within existing literature.

Theme 1: Effectiveness of MAT

The review often proved that MATs, including powered wheelchairs, robotic exoskeletons, AFOs, and gait trainers, significantly improved children's mobilisation and independence from CP (Poli, 2021). The aforementioned 15 studies dealt with powered wheelchairs, identified as the most influential MATs to enhance indoor or outdoor mobility in children with severe motor impairment (Thakorbhai, 2023).

Children who used powered wheelchairs had a higher level of participation in everyday activities, such as going to school and playing with friends (Gusenbauer & Haddaway, 2020). Robotic exoskeletons were part of 10 studies that offered a child an independent source of assistance by standing and walking with reduced muscle exhaustion. Robotic exoskeletons supported children who could not utilise powered wheelchairs due to high-level motor impairment. In addition, eight articles assessed the benefits of AFOs in enhancing gait and postural abilities(Pollock et al., 2023). While AFOs allowed a child to ambulate with reduced impedance, long-term use was also limited by discomfort and potential frequent adjustments at each growing stage (Hossain, 2018).

Theme 2: Barriers to Adoption of MAT

The review identifies barriers to the widespread use of MAT with children with CP. High costs were cited as challenging in 20 studies and remain an issue, especially for low-income regions. Powered wheelchairs and robotic exoskeletons are often too expensive for most families (Ghosh & Raman, 2019). Customisation was another commonly noted barrier, as found by 13 studies. All children with CP have different motor disability extents, and consequently, their assistive technologies vary differently (Diment et al., 2024). An unsuitable adjustment leads to discomfort and poor fit, and the device uses undershooting (Klich, 2024).In addition, nine studies pointed out a greater need for better training for the children and their caregivers regarding complex devices such as powered wheelchairs and robotic exoskeletons. It is being put to waste when technologies are used without proper user training.

Theme 3: Psychosocial Impact of MAT

Excluding the physical and psychosocial implications that exist for the use of MATs, which have seemed like a pervasive theme in 12 studies, Obvious devices such as powered wheelchairs sometimes symbolise social isolation or stigma to children and their families (Sahoo & Choudhury, 2023). However, MATs represent fantastic advantages in improving mobility, and their biggest challenge is the easy acceptability of those devices in society. The children are very attentive to their condition, especially in public places. This becomes too conspicuous. Many researchers have argued the need for acceptable or less visible designs to reduce stigmatisation and foster social interaction with CP children (Hossain, 2018). This area of device design needs to be researched to see if MATs will get children moving and undoubtedly comfortable and included in social environments. The review points out directions that future research should take: more affordable and customisable MAT designs that meet the variety of CP children's needs.

More importantly, however, are the longitudinal studies that will be significant in determining the long-term impacts on users' physical, cognitive, and psychosocial wellsprings (Zhang et al., 2023). Subsequently, the application of MAT should eliminate the stigma attached to it, and designers must select design innovations that improve functionality and acceptability among social actors. Thematic analysis suggests that although children with CP experience positive benefits of their independence by using MATs, there are, nonetheless, barriers facing the successful use of MATs: costs, customisation, and perceived social stigma. Continued innovation in their design and access could otherwise ensure that socioeconomic differences do not end up preventing all children from being able to take full advantage of these life-changing devices.

4. DISCUSSION

This literature review aimed to evaluate the efficacy, obstacles, and psychosocial effects of mobility assistive technologies (MAT) with a particular focus on the population of children with cerebral palsy (CP). The results show how the advantages of these technologies are counterweighted by hindrances faced when attempting to implement and use them. This review aims to map out the status of MAT concerning children with CP and the psychosocial impact and barriers to adopting MAT by identifying some opportunities for

further improvement. The analysis indicated that MAT, in all its aspects, primarily powered wheelchairs and robotic exoskeletons, has a favourable impact on children with CP in terms of mobility and independence somehow possessed by these children. This is consistent with previous evidence, including Saleh et al. (2023) and Zhang et al. (2023), which also showed that powered wheelchairs enabled children's greater participation in educational and social activities.

The evidence described in this review confirms this. It suggests that children using powered wheelchairs are more satisfied and active in everyday life and vice versa, focusing on children who do not use these assistive devices. Powered exoskeletons were indeed found to improve walking performance, especially for those with the most severe deficits, replicating results from Smorenburg et al. (2020) regarding the benefits of these devices for motor function enhancement. Still, although the effectiveness of MAT is well supported by literature, the review revealed counterindications that limit their adoption level.

The high costs of care continued to be an issue that plagued the residents of the institutions, and this was consistent with the findings of Zhang et al. (2023), which showed that advanced technologies are out of reach within low-income settings. Customisation to suit children with diverse CP-related mobility problems was noted as a growing obstacle as children with CP have fluid mobility issues. This includes previous studies that indicate that without any alterations made, MAT may not serve the desired effectiveness (Frank & De Souza, 2017). In addition, the need for intensive training for both users and caregivers was stressed, which agrees with the findings of Mtshali and Khubisa (2019) concerning measures that would promote the effective use of MAT.

Another problem is the psychosocial consequences of MAT usage, which have been addressed to some extent. However, the review also showed that the devices that rehabilitate physical mobility also come with social stigma and loneliness. This is particularly prevalent among kids who are on very conspicuous mobility improvers, with powered wheelchairs being at the centre of usage. Many works, including those of Sahoo and Choudhury (2023), emphasise these issues, and there is a call for more design concepts that users will be more comfortable with and so reduce the stigma attached to the use of MAT. The psychosocial aspect should be taken into account when using any assistive design since it affects not only the child's desire to use the device but the quality of life as well. In conclusion, this literature review has achieved its objectives by amassing available literature on MA technology for children with CP.

It points out that although these technologies are promising in improving mobility and independence, factors such as cost, customisation, and user training, identified as weak points, need to be addressed to realise their full potential. Thus, it recommends the need for more research on designing and developing MAT, which is more economical and acceptable in society, and studies to follow up on the contribution of such MAT to the growth of the individual both physically and socially. By providing a cohesive presentation of how the specified themes relate to the overall goals of the study, this section provides practical implications for theories, policies and practitioners. These highlight the need to adopt an integrated approach in addressing MAT so that every child with Cerebral Palsy can use them positively and enhance integration.

6. CONCLUSION AND RECOMMENDATIONS

Mobility assistive technologies (MAT) involving mobility aids for children with cerebral palsy (CP) have been critically reviewed in this literature study. The review has, however, also identified challenges in their full implementation.

The analysis pointed out three domains: the efficacy of the different MATs, the obstacles to their use, and the psychosocial effects experienced. Based on 43 studies, the authors point out that while the introduction of MAT enables physically disabled children to have a high degree of mobility and independence, existing problems such as high costs of devices, lack of personalisation, and inadequate training are still present.

The MAT mainly powered wheelchairs and robotic exoskeletons merit the current understanding demonstrated by literature and, therefore, positively change the physical interactions and social engagements of children with cerebral palsy. The technologies allow children to be more active in performing, which leads to independence and promotes a better quality of life for these children. These barriers enumerated provide enormous concern on the use of advanced technology with financial risk as a primary barrier to access the equity of children from all families regardless of their economic status; political will is crucial, and innovative finance models are needed. Customisation of MAT has become a prominent determinant of its effectiveness and usability. The reason why many children with cerebral palsy require assistance is to ensure that the assistive devices will expand to suit the evolving needs of children. In the absence of such modification, the benefits of MAT may be unachievable to their fullest. In addition, there is a demonstrated need for better training of both partners and healthcare providers to take full advantage of these technologies; some users have problems using complicated devices and supporting explanations by some technical proof of gadgets.

It is important to note that the social aspects of MAT use are equally important. These technologies make it easier for a person to move, but they also create risks of stigmatisation and social loneliness. To solve these problems, the need for children to utilise MAT to retain good self-esteem is concerning. As a result, the psychosocial and design challenges children face when using MAT need to be tackled in a multidisciplinary way involving all stakeholders, including researchers, clinicians, policymakers, and technology developers, to increase the success and uptake of MAT. Research should then pay attention to affordable assistive devices that can be easily modified and growing technologies that will not exclude people in society. However, the longitudinal effects of MAT in children who have Cerebral Palsy also across their physical development and psychosocial development are hard to ignore, and there is no such evidence available apart from establishing MAT.

In conclusion, MAT and other related, even advanced technologies have much hope for improving the lives of children with cerebral palsy, especially if combined with reasonable parenting, to understand the intention and purpose of their integration. In overcoming these barriers and working on advances in assistive technology, we can guarantee that every child with CP can reach higher levels of autonomy and social inclusion, improving their quality of life and lessening the pressure on their families and caregivers.

6.1 Limitations and Future Research

Regarding the existing research, the positive impact of mobility assistive technologies on children is evident. However, a few domains need to be researched further to improve the performance and use of the devices. Admin Adaptability and Personalization: Children with CP must have more adjustable, somewhat steady AT devices. How ATs can be effectively carried out during interventions (Zhang et al., 2023). The research direction must be to prepare a more affordable means of moving without losing quality. This will also facilitate low-income parents' access to advanced technologies such as powered wheelchairs and robotics.

According to the literature, further studies regarding the extended use of mobility ATs are required since no research was targeted at studying the repeated effects of mobility ATs on deficits in children with CP. The findings also suggest practical ideas for practice where consideration is given over time to the use of devices for children. More studies are needed to understand better the psychosocial aspects of using mobility assistive technologies. This includes how children with CP regard these devices and how to reduce stigma and enhance social integration (Billen & Fonteyn, 2022). Technologies such as virtual reality and intelligent systems are some of the new ways that are likely to change the usability of mobility ATs for users. Future works should address how these innovations can be applied to existing technologies to improve their use and effectiveness (Karami et al., 2023). The review identifies several areas where further research is needed to improve the design, affordability, and accessibility of mobility assistive technologies for children with CP.

Future research should focus on developing more adaptable and customisable assistive technologies to meet the specific and changing needs of children with CP. Strategies to reduce the cost of advanced mobility devices, including powered wheelchairs and robotic exoskeletons, are crucial to ensuring broader access for all children, particularly in low-income settings. There is a need for more longitudinal studies to assess the long-term impact of mobility-assistive technologies on children's physical, cognitive, and social development (Zhang et al., 2023). Considerable efforts must be put into mapping the psychosocial aspects of MAT use within the community of children suffering from CP. It would be helpful to examine the effects of these tools on self-image, emotional feelings, general well-being, and prospects for social acceptance as part of the inclusive design of such technologies. Studies that include children and their families will be critical while investigating attitudes towards assistive technologies.

Integrating some emerging technologies such as artificial intelligence (AI), machine learning, and smart home devices into MAT is breathtaking. New questions need to be addressed to explore how these technologies can provide added value and create new possibilities for assistive technologies. For instance, a smart wheelchair could be designed using AI technology to help wheelchair users navigate their environment based on their preferences. The future direction should also include advocating for appropriate MAT policies where and when necessary. It will be essential to create comprehensive frameworks that facilitate funding of assistive devices, increase supportive design approaches and implement training and supportive standards for the mobility of all children with CP.

REFERENCES

Baldelli, G., De Santi, M., De Felice, F., & Brandi, G. (2021). Physical activity interventions to improve the quality of life of older adults living in residential care facilities: A systematic review. *Geriatric Nursing, 42*(4), 806-815. https://doi.org/10.1016/j.gerinurse.2021.04.011.

Bekteshi, S., Monbaliu, E., McIntyre, S., Saloojee, G., Hilberink, S. R., Tatishvili, N., & Dan, B. (2023). Towards functional improvement of motor disorders associated with cerebral palsy. *The Lancet Neurology, 22*(3), 229-243. DOI: 10.1016/S1474-4422(23)00004-2.

Bekteshi, S., Nica, I. G., Gakopoulos, S., Konings, M., Maes, R., Cuyvers, B., Aerts, J.-M., Hallez, H., & Monbaliu, E. (2022). Exercise load and physical activity intensity in relation to dystonia and choreoathetosis during powered wheelchair mobility in children and youth with dyskinetic cerebral palsy. *Disability and Rehabilitation, 44*(17), 4794-4805.

Billen, M., & Fonteyn, L. (2022). Functional balance, motor competence, and their relationship in children with cerebral palsy compared to typically developing children: A case-control study. *Journal of Pediatric Physical Therapy, 34*(2), 123-130. https://doi.org/10.1097/PEP.0000000000000889

Bona, S., Donvito, G., Cozza, F., Malberti, I., Vaccari, P., Lizio, A., Greco, L., Carraro, E., Sansone, V. A., & Lunetta, C. (2021). The development of an augmented reality device for the autonomous management of the electric bed and the electric wheelchair for patients with amyotrophic lateral sclerosis: A pilot study. *Disability and Rehabilitation: Assistive Technology, 16*(5), 513-519. doi.org/10.1080/17483107.2019.1683237.

Bonello, M., Farrugia, P., Buhagiar, N., & Mercieca, J. (2022). Towards a multi-user experience approach to exploring key requirements to design smart habilitation devices for children with cerebral palsy. *Journal of Rehabilitation and Assistive Technologies Engineering, 9*, 20556683221103164. https://doi.org/10.1177/20556683221103164.

Candiotti, J. L., Kamaraj, D. C., Daveler, B., Chung, C.-S., Grindle, G. G., Cooper, R., & Cooper, R. A. (2019). Usability evaluation of a novel robotic power wheelchair for indoor and outdoor navigation. *Archives of Physical Medicine and Rehabilitation, 100*(4), 627-637. https://doi.org/10.1016/j.apmr.2018.07.432.

Desouza, L. H., & Frank, A. O. (2016). Rare diseases: Matching wheelchair users with rare metabolic, neuromuscular or neurological disorders to electric powered indoor/outdoor wheelchairs (EPIOCs). *Disability and Rehabilitation, 38*(5), 488-494. https://doi.org/10.3109/09638288.2015.1106599.

Dhas, V. G. & Uthariaraj, V. R. (2014). Distribution of load using mobile agent in distributed web servers. *American Journal of Applied Sciences*, *11*(5), 811-817. doi.org/10.3844/ajassp.2014.811.817.

Diment, L., Curtin, S., Kenney, L., Reynolds, K., & Granat, M. (2024). Priorities when designing a service-focused delivery model for mobility devices: a systematic review. *Disability and Rehabilitation: Assistive Technology*, 19(8), 2442-2453. doi:10.1080/17483107.2024.2313077.

Downey, D., & Hurtig, R. (2003). Augmentative and alternative communication. In D. R. Beukelman & J. C. Light (Eds.), *Augmentative and Alternative Communication: Supporting Children and Adults with Complex Communication Needs* (5th ed., pp. 466-474). Brookes Publishing.

Encarnação, P., & Cook, A. M. (2023). What are assistive technologies. In A. E. Beckett & A. M. Callus (Eds.), *The Routledge International Handbook of Children's Rights and Disability* (pp. 432-449). Routledge. https://doi.org/10.4324/9781003056737-33.

Field, D. A., Borisoff, J., Chan, F. H., Livingstone, R. W., & Miller, W. C. (2022). Standing power wheelchairs and their use by children and youth with mobility limitations: an interrupted time series. *Disability and Rehabilitation: Assistive Technology*, *19*(2), 454-464. https://doi.org/10.1080/17483107.2022.2096933.

Fieremans, N., Van Esch, H., Holvoet, M., Van Goethem, G., Devriendt, K., Rosello, M., ... & Froyen, G. (2016). Identification of intellectual disability genes in female patients with a skewed X-inactivation pattern. *Human mutation*, *37*(8), 804-811. https://doi.org/10.1002/humu.23012.

Fosch-Villaronga, E., & Drukarch, H. (2023). Accounting for diversity in robot design, testbeds, and safety standardization. *International Journal of Social Robotics, 15*(11), 1871-1889. https://doi.org/10.1007/s12369-023-00974-6.

Frank, A. O., & De Souza, L. H. (2017). Problematic clinical features of children and adults with cerebral palsy who use electric powered indoor/outdoor wheelchairs: A cross-sectional study. *Assistive Technology, 29*(2), 68-75. https://doi.org/10.1080/10400435.2016.1201873.

Ghosh, R., & Raman, L. (2019). National Conference on Assistive Technology for All 2030. *Proceedings of the National Conference on Assistive Technology for All AT-2030, Mobility India.*

Gusenbauer, M., & Haddaway, N. R. (2020). Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources. *Research Synthesis Methods, 11*(2), 181-217.https://doi.org/10.1002/jrsm.1378.

Hamilton, C., Lovarini, M., van den Berg, M., McCluskey, A., & Hassett, L. (2022). Usability of affordable feedback-based technologies to improve mobility and physical activity in rehabilitation: a mixed methods study. *Disability and Rehabilitation, 44*(15), 4029-4038. https://doi.org/10.1080/09638288.2021.1884904.

Hornero, G., Conde, D., Quilez, M., Domingo, S., Rodríguez, M. P., Romero, B., & Casas, O. (2015). A wireless augmentative and alternative communication system for people with speech disabilities. *IEEE Access*, 3, 1288-1297. DOI: 10.1109/ACCESS.2015.2466110.

Hossain, M. (2018). Frugal innovation: A review and research agenda. *Journal of Cleaner Production, 182,* 926-936. https://doi.org/10.1016/j.jclepro.2018.02.091.

Kakooza-Mwesige, A., Byanyima, R. K., Tumwine, J. K., Eliasson, A. C., Forssberg, H., & Flodmark, O. (2016). Grey matter brain injuries are common in Ugandan children with cerebral palsy suggesting a perinatal aetiology in full-term infants. *Acta Paediatrica*, *105*(6), 655-664. https://doi.org/10.1111/apa.13352.

Karami, H., Maludrottu, S., Vassallo, C., Laffranchi, M., & De Michieli, L. (2023). Review and analysis of platform-related performance of rehabilitation lower limb exoskeletons. *Actuators, 12*(11), 406. https://doi.org/10.3390/act12110406

Klich, J. (2024). *Human enhancement technologies and healthcare policy*. Taylor & Francis.

Li, B., Cunha, A. B., & Lobo, M. A. (2024). Effectiveness and users' perceptions of upper extremity exoskeletons and robot-assisted devices in children with physical disabilities: systematic review. *Physical & Occupational Therapy in Pediatrics*, *44*(3), 336-379. https://doi.org/10.1080/01942638.2023.2248241.

Loncke, F., Weng, P.-L., Fries, B., & Williams, D. F. (2017). Augmentative and alternative communication. In R. L. Graham & S. E. Fitzmaurice (Eds.), *Communication sciences and disorders* (pp. 275-291). Psychology Press

Luna Lorente, B., Polo Martínez, L., Ruiz Penichet, V. M., & Lozano Pérez, M. D. (2024). Assistive technologies for children with physical disabilities: A systematic literature review. *Proceedings of the XXIV International Conference on Human Computer Interaction, Interacción 2024, A Coruña, Spain*. ACM. https://doi.org/10.1145/3657242.3658595.

Matsuda, N., Chapiro, A., Zhao, Y., & Smith, C. (2022). Realistic luminance in VR. *SIGGRAPH Asia 2022, 36*(4), 123-130. https://doi.org/10.1145/3550469.3555427.

Mtshali, P., & Khubisa, F. (2019). A smart home appliance control system for physically disabled people. 2019 Conference on Information Communications Technology and Society (ICTAS), Durban, South Africa. *IEEE*. DOI: 10.1109/ICT Chan. AS.2019.8703637.

Poli, M. (2021). Smart Technologies and the Case of People with Disabilities: A Preliminary Overview. *Novelties in Intelligent Digital Systems*, 217-222. doi:10.3233/FAIA210096.

Pollock, D., Peters, M. D., Khalil, H., McInerney, P., Alexander, L., Tricco, A. C., Evans, C., de Moraes, É. B., Godfrey, C. M., & Pieper, D. (2023). Recommendations for the extraction, analysis, and presentation of results in scoping reviews. *JBI Evidence Synthesis, 21*(3), 520-532. *DOI:* 10.11124/JBIES-22-00123.

Sahoo, S. K., & Choudhury, B. B. (2023). Wheelchair accessibility: bridging the gap to equality and inclusion. *Decision Making Advances*, *1*(1), 63-85. https://doi.org/10.31181/dma1120239.

Saleh, R. H., Durugbo, C. M., & Almahamid, S. M. (2023). What makes innovation ambidexterity manageable: a systematic review, multi-level model, and future challenges. *Review of Managerial Science*, 17(8), 3013-3056. https://doi.org/10.1007/s11846-023-00659-4.

Smorenburg, S. P., Montesano, M., Hoogteijling, T. J., Truijers, M., Symersky, P., Jansen, E. K., Zandbergen, H. R., Wisselink, W., van Schaik, T. G., & Yeung, K. K. (2020). Anatomic suitability for branched thoracic endovascular repair in patients with aortic arch pathological features. *Journal of the American Heart Association, 9*(20), e016695. https://doi.org/10.1161/JAHA.120.016695.

Tegler, H., Pless, M., Blom Johansson, M., & Sonnander, K. (2021). Caregivers', teachers', and assistants' use and learning of partner strategies in communication using high-tech speech-generating [1] devices with children with severe cerebral palsy. *Assistive Technology*, [2] 33(1), 17-25. https://doi.org/10.1080/10400435.2019.1581303

Thakorbhai, P. P. (2023). *Investigations on prosthetics/orthotics elements developed from polymers and its composites* [Doctoral dissertation, Maharaja Sayajirao University of Baroda]. Shodhganga. https://shodhganga.inflibnet.ac.in/

Zangari, C. (2019, December 12). How we do it: AAC strategies & adaptations for students in support walkers, assessment & funding. *PRAactical AAC*. https://praacticalaac.org/praactical/how-we-do-it-aac-strategies-adaptations-for-students-in-support-walkers-assessment-funding/.

Zhang, T., Che Me, R., & Alli, H. (2023). The usability issues encountered in the design features of intelligent products for older adults in China: A scoping review. *Sustainability, 15*(5), 4372. https://doi.org/10.3390/su15054372.

Career Planning Process Strategy for Students in Guangxi Police College, Guangxi Province, China

Su Weilun[1], Pong Horadal[2]*, Nuttamon Punchatree[3]

[1-3]The Graduate School of Bansomdejchaopraya Rajabhat University, 1061 Soi Itsaraphap 15, Hiranruchi, Thon Buri, Bangkok 10600, Thailand

Article Information	ABSTRACT
Article Type: Research Article **Corresponding Author:** Pong Horadal 827952344@qq.com	This study aimed to evaluate and enhance the career planning process for students at Guangxi Police College, focusing on quantitative and qualitative insights. A mixed-methods approach was employed. In Phase 1, a quantitative survey of 248 recent graduates was conducted to assess their satisfaction with the college's career planning strategies. Phase 2 comprised qualitative focus group discussions with nine faculty members gathering in-depth perspectives on the effectiveness of current career planning practices. The findings revealed a generally high level of student satisfaction, with an overall mean score of 3.64 out of 5. However, areas such as self-assessment and goal setting scored slightly lower, indicating opportunities for improvement. Faculty feedback emphasised the need for regular updates, external evaluations, and increased real-world exposure to better prepare students for the job market. The study concludes that while Guangxi Police College has established a strong foundation in career planning, there is still room for further enhancement. Targeting enhancements in self-assessment, goal setting, and practical application could significantly improve student outcomes. These findings correspond with existing research, underscoring the importance of a comprehensive and context-sensitive approach to career planning in specialised educational institutions. **Keywords:** Career Planning; Student Satisfaction; Career Strategy Development; Guangxi Police College; China

1. INTRODUCTION

Career development is a component of student training that plays an important role in students' future professions, especially in distinct institutions like police colleges (Feifei et al., 2023). Guangxi Police College in Guangxi province, China, is one such police college that trains its students for establishing career strategy development. In these law enforcement educational institutions, education is not limited to acquiring knowledge and skills but targets to enhance the potential and competency of future human resources that will enforce the law and ensure order (Feifei et al., 2023). Though institutions focus on impressive academic and physical development, there is a rise in apprehension towards the efficiency and totality of today's career development processes. Career planning should be systematic and planned to ensure students can upgrade their career goals with the demands of the workplace. This focus towards career planning entails opportunities in the law enforcement sector, which is usually left unheeded in most of these institutions (Jie, 2024).

From a career development perspective within a police department, career development extends beyond job placement. It encompasses the entire career cycle of an individual to ensure they are placed in the proper role and can grow productively within society (Guo et al., 2019). This issue is becoming increasingly significant as the nature of police activity evolves. The 21st century has introduced numerous changes to the types of offences that police organisations must address. In this technological era, new forms of criminal activity, such as cybercrime, are prevailing that demand the police force to be well-equipped for the dilemma, both in terms of equipment as well as ability; in addition, the shift in the community expectations of the police to focus on the community policing, emotional intelligence, and the police public relations skills have been significantly on the rise (Dasheng et al., 2013). These changes require a force that is not only trained in conventional police work but also should be progressive in mind and possess the skills to tackle these new challenges.

Nevertheless, the rapidly increasing demands for professional policing have not significantly altered the established patterns of career development programs in police colleges worldwide, including the Guangxi Police College. It integrally requires due consideration to offer career stability to these graduates in correspondence with the dynamics of the new era. Otherwise, an absence of a forward-looking approach leads to undesirable career status or working conditions among graduates in the modern law enforcement sectors (Sîrbu et al., 2014). In this respect, it is possible to consider that the primary significance of the presented research is its practical focus on the students at the Guangxi Police College, which have inherently received less attention as a group of consumers in the preceding studies. Although there exists a vast literature on career development in general, only a few scholars have focused on students in police training institutions, especially considering the globally dynamic socio-economic and technological era of China (Fauzana et al., 2021). This research intends to bridge that gap by developing an elaborate career development plan that will fit the students of Guangxi Police College, given that it aligns with their current situation and future dreams. The strategy suggested in this study will transcend career counselling to include components that prevail in the evolving nature of the law enforcement profession by incorporating technological competence, emotional quotient, and continued learning (Hani et al., 2021).

The urgency of this research is derived from the understanding that the effectiveness of China's law enforcement agencies of the future largely depends on the quality of the career forecasting offered to prospective members. A proper career development process would allow not only for the student's employment after the completion of their studies but also for the necessary and sufficient skills and competency to be able to perform and progress in their occupation, and thus provide better protection to society (Hassan et al., 2022). In this regard, the current career planning processes that are in practice in higher learning institutions such as the Guangxi Police College do not suffice, whereby the conventional ones are defective as they do not prepare the students with the social tools required to operate within the modern paradigm of the police force and crime detection. Furthermore, this research attempt aims to develop a general understanding of career development within specified educational establishments. It can be helpful for replication or modifying police training institutions in China or other countries (Arhipova & Kokina, 2022). This research aims to increase the effectiveness of the policing industry in Guangxi Province by fulfilling the career development requirements of police college students. The changes are being made to have a more competent, motivated and resilient police force better placed to handle the demands of modern policing (Volchenkova et al., 2022).

Technology literacy is one of the program's proposed overarching career planning strategy components. Law enforcement agencies use technology more frequently to fight crime through surveillance, gadgets, data analysis, or other high-tech means. Thus, future officers must not only know about this but also be able to apply it.

This has to influence the curriculum offered to the students at police colleges such as the Guangxi Police College and impose changes that would prepare them sufficiently to face the technological aspects of their future work (Litynska, 2023). The second key component identified in the strategy is cultivating emotional intelligence among students. With emerging societal trends and changing expectations of police officers, there is increasing concern about how police departments can hire officers who are proficient in the technical aspects of their work and capable of managing the interpersonal elements that are becoming central to modern policing (Umar, 2021). This involves interpersonal communication skills in establishing and maintaining mutually beneficial assertive relationships with the clients and the public, along with stress and conflict management and understanding the social spectrum of issues which form the theme of policing (Khoso et al., 2022). Therefore, police colleges should consider training emotional intelligence to prepare their graduates for the rough demands of their careers to improve their contribution to society (Sari & Dwiarwati, 2023).

This paper is structured to evaluate the career planning process at Guangxi Police College comprehensively. It begins with an introduction that outlines the study's aims, objectives, and significance in career planning within specialised educational institutions. The literature review then explores existing research on the concept, importance, and successful career planning strategies, linking these findings to the context of Chinese universities and law enforcement education. The methodology section elaborates on the mixed-methods approach, including the quantitative survey of graduates and qualitative focus group discussions with faculty members. In the results and analysis section, the study presents the quantitative data on student satisfaction and qualitative insights from faculty, highlighting key findings. The discussion interprets these findings, aligning them with existing research and identifying areas for improvement. Finally, the conclusion summarises the study's contributions, emphasising the need for targeted enhancements in the college's career planning process to better prepare students for the workforce.

2. LITERATURE REVIEW
2.1 Concept of Career Planning

Career management is a complex construct that evaluates and forecasts career goals, steps, and personal and career-related activities to attain a particular employment result (Yang & Wong, 2020). Career planning has been the subject of significant discussion in the literature regarding the importance of career planning to guarantee that people's skills, interests, and values match their careers. It is, therefore, unique to acknowledge that career planning is more of a developmental approach and not solely a one-time activity because the career path of most people are marked with frequent changes that they have to make based on personal factors, labour market demands, and general economic conditions (Shen, 2022). It includes self-employment review, career choice, acquisition of skills and setting personal goals, which are very important in the ultimate career planning (Tang, 2019). Therefore, Career planning has been highlighted in various research as instrumental to organisational performance, job satisfaction, career progression, and overall quality of life.

Tian and Chen (2018) posit that designing for career success facilitates the development of personal and organisational strategies that will maximise opportunities regarding the person's occupational course. This anticipatory behaviour improves career outcomes and provides more stability and resilience in the evermore uncertain and saturated labour market environment. Career planning has shown a positive correlation with career self-efficacy. Mainly, clients that undertake systematic career planning are more likely to enjoy and succeed in their careers (Wang et al., 2022). Since career development is highly valuable in the specialisation of career fields, it carries even more importance within such areas of work as law enforcement. Law enforcement careers involve individuals possessing specific technical knowledge and skills and learning new strategies simultaneously as they face new challenges such as technology, society, and law changes (Dasheng et al., 2013).

Based on these demands, the career development process within learning institutions like the Guangxi Police College must be clearly defined and well-coordinated. As to the relevancy of literature to the present study, the emphasis on career planning in Guangxi Police College is well-timed and warranted. The literature also points out that due to enhancing students' curriculum vitae, career planning is equally relevant for their successful employment and further career progress in such a specialised area of study as law enforcement (Zhang et al., 2024). Therefore, this study seeks to fill existing gaps in career planning procedures at Guangxi Police College by constructing a strategy that corresponds to specific student needs of law enforcement and is based on self-entrance, goal setting and skills enhancement.

2.2 Importance of Career Planning in Universities

Universities career development has become one of the most important components of learning, gaining experience with a high degree of occupational relevance and students' employability (Wang et al., 2023). With the complexity level of the international labour market, compounded by the effects of advanced technology and emergent economic conditions, career development has become one of the essential components of higher education (Khoso et al., 2022). Today's universities are no longer places where students go to be educated academically but have become places where students are prepared to transform into a workforce or at least are exposed to the skills, the knowledge and the strategies that can enable them to undertake their future careers effectively (Liu, 2020). For such reasons, career planning has become very significant in universities, highlighting the increasing concern for employability. Higher education institutions now focus on graduate careers, with demands for measurable output on the achievements of institutions. Regarding graduate employment outcomes, career planning services have assumed the role and service delivery function of preparing students for academic to working life (Xue, 2023).

Moreover, university career development activities are important because they aim to enhance perceived self-efficiency. Career self-efficacy is a person's belief in the ability to perform some behaviours regarding career advancement, which is drastically boosted by systematic career planning (Ma, 2014). Students who participate in career hunting acquire skills for career development and focus on mapping out different career paths that entirely elevate their perceived self-efficacy. This self-efficacy helps graduates be more effective in their job tasks and more robust in responding to career challenges. This makes graduates fully equipped to face the various considerations inherent in the job insecurity of today's labor market. The literature also acknowledges career planning to help overcome the skills mismatch common among university leavers and employees. Employers make common complaints that their graduate employees are deficient in interpersonal skills, including communication, teamwork, collaboration and problem-solving skills.

The gap may be closed by university career planning services providing training, workshops and realistic exposures that enable students to acquire these competencies through their university education before joining the workforce (Foshaugen, 2023). The literature linked to this study signifies the need to establish career planning in universities, especially colleges such as the Guangxi Police College. A systematic and very elaborate approach to career development is vital in law enforcement education, where the matter at concern is personal success and a positive impact on society (Brown & Lent, 2020). Due to the peculiarities of the law enforcement working conditions and the requirements of the employee, including the ability to respond to new forms of work with the help of technologies, the use of emotional intelligence, and decision-making, the significance of career planning becomes evident (Chen, 2003). By providing career guidance services, the Guangxi Police College is in a good position to prepare the students to yield positive results in their chosen careers, thereby enhancing police performance in society. Furthermore, the literature examines the implication of improved career advancement on the general efficiency of police training centers (Brown & Lent, 2020).

2.3 Successful Career Planning Strategies

Career and development planning intervention is highly relevant to understanding current employment challenges (Holland, 1997). This proposed various approaches, including self-orientation, objective setting, skill enhancement, and occupational awareness, to help students prepare for their careers. All the above strategies should be designed to fit every student's conceived direction (Brown & Lent, 2020). Discussing the concept of career planning in students, the literature points to a range of strategies that are most effective in directing people's careers in the future. Self-assessment techniques, especially the extensive forms, are among the most effective. Students differentiate their strengths and weaknesses and choose their preferences and important personal values. The best practice begins when it comes to choosing a career. Through self-assessment, students can identify the career that best suits them, possibly due to their attributes or dreams (Savickas, 2005). Personality and interest inventories can clearly understand which career choices will be more fulfilling and successful for each learner (Raabe et al., 2007).

The career-planning strategy implores effective interventions that include developing a command of core technical knowledge and acquiring functional interpersonal skills like communication and collaboration, which can ultimately lead to career success. Universities and educational institutions provide practical opportunities to attain such skills through coursework, internships, and workshops, enabling them to enhance their employability and shape their career paths (Kuijpers et al., 2011). Another key strategy is career exploration, which involves assessing different occupations and gaining practical exposure to various career fields. The students who explore careers by actively availing resources are more likely to find careers that align with their personalities. Relating this literature to the present study, most of these researches depict strategies in career planning that are successful in the context of the present research, Guangxi Police College. Because law enforcement students are under pressure to build their technical skills, self-management skills, and emotional empathy, law enforcement career development must be approached with considerable uniqueness. For example, self-estimated guides enable learners to recognise traits and competencies essential to obtaining the goal in police work (Khoso et al., 2022). This argument has found that setting goals can create a guideline from which the students can be guided to learn these skills and handle the profession's challenges (Li & Huangfu, 2015).

2.4 Current Career Planning Education at Chinese Universities

In recent years, career planning education among learners in Chinese universities has received more attention as the country transforms into an economic superpower. With China moving from an industrialised economy to a new age of knowledge-based economy, there is a need to prepare students for this new era's job market. Chinese universities have paid attention to this demand and incorporated career development education into the curriculum. However, the programs are ineffective in terms of efficiency for various universities. For many years in Chinese universities, an organised method of career planning was not precisely noticeable. It barely included random sessions of career counselling and occasional seminars. However, the education sector has developed due to market competition and advanced systematic career planning techniques. More institutions are incorporating dedicated departments of career counselling that provide guidance and assistance in job hunting and training sessions. With increasing concern, courses on career planning have been inducted as part of the curriculum in educational institutions. Offering such courses will help fresh graduates to cope with the job market and its challenges.

While there has been progressive development in career planning education, there are still significant barriers to its effectiveness, particularly in the context of police departments. One primary concern is the shortage of professional career advisors specialising in law enforcement, limiting their ability to guide students effectively through this unique career path (Hani et al., 2021). Career services offices are often underfunded and inadequately staffed, especially in police-related programs. Additionally, the available staff may lack the specialised training to assist students with diverse career interests in policing, which requires technical and interpersonal competencies. Another issue is the mismatch between the career preparation education provided by universities and the actual demands of the police workforce. This results in a gap between student expectations and the realities of the job market, particularly in fields like law enforcement that require a specific level of expertise (Hassan et al., 2022). While students are often trained to seek employment, they may not be fully prepared for the challenges and demands of careers in policing. Addressing these gaps is essential to improving career development in police education programs.

2.5 Synthesised Dimensions of Career Planning

Based on a systematic literature review, key dimensions of career planning have been identified and are presented in Table 1 and conceptual model is presented in Figure 1. These include self-efficacy, goal setting, learning and development, career exploration, integration, and application. Various studies support each dimension, highlighting their relevance and impact on successful career planning (Brown & Lent, 2020; Lent et al., 1994; Yanni & Khairani, 2020).

Table 1. Synthesised Dimensions of Career Planning Process

Dimension	Source
Self-Assessment	Lent, Brown, & Hackett (1994); Brown & Lent (2020); Fauzana et al. (2021); Li (2007); Sampson et al. (2004)
Goal Setting	Lent, Brown, & Hackett (1994); Brown & Lent (2020); Lavankura (2013); Fauzana et al. (2021), and Jiang et al. (2019); Betz & Hackett (2006)
Learning and Development	Brown & Lent (2020); Fauzana et al. (2021); Lent et al. (1994)

| Career Exploration | Chen (2003); Jiang et al. (2019); Brown & Lent (2020) |
| Integration and Application | Brown & Lent (2020); Sampson et al. (2004); Egerău (2017); Lavankura (2013) |

Career Planning Process:

Self-Assessment;

Goal Setting;

Learning and Development;

Career Exploration

Integration and Application
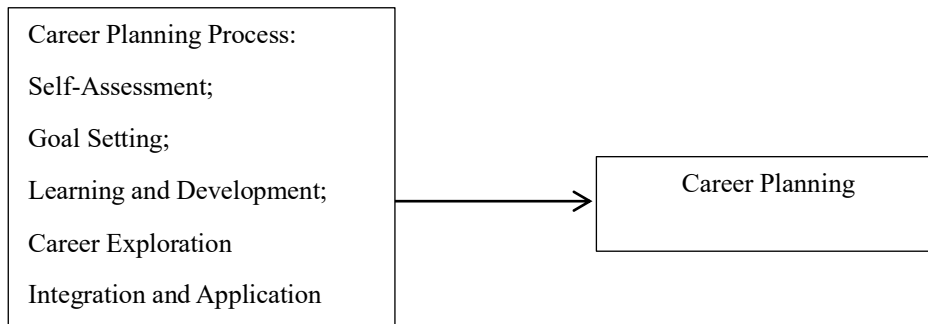
→ Career Planning

Figure 1. Conceptual Framework

3. METHODOLOGY
3.1 Research Design

This study aims to evaluate and enhance the career planning process for students at Guangxi Police College. It will focus on quantitative and qualitative research methods to gather comprehensive insights. The research is divided into two phases, each focusing on different populations within the college. The first phase is a quantitative study to assess students' satisfaction with the existing career development process. This involves administering a cross-sectional survey on recent graduates using structured questionnaires to systematically measure their satisfaction with various aspects of career services and identify areas of concern. The second phase employs a qualitative research approach, gathering detailed insights from faculty members actively involved in career development. This phase includes conducting focus group discussions with experienced faculty to gather their perspectives on the current career planning process and their suggestions for improvement. The advantage of this approach is that it allows for a comprehensive evaluation of career planning from both quantitative and qualitative perspectives, ensuring the study assesses the effectiveness of career planning while capturing the attitudes and experiences of key stakeholders involved in its implementation and use.

3.2 Ethical Consideration

Ethical standards were strictly followed at each stage of the study. Informed consent was obtained from all participants in the quantitative and qualitative phases. For the quantitative phase, participants were informed of the study's purpose, procedures, and their right to withdraw at any time. Consent was obtained electronically through secure online surveys. For the qualitative phase, faculty members participating in the focus group discussions provided written consent, and their anonymity was ensured through pseudonymisation. In the qualitative part of the research, the focus group discussion was conducted and tape-recorded with the participants' permission. Transcriptions were re-identified, and no personally identifiable information was provided to keep the faculty members anonymous. The ethical clearance of the study was sought and obtained from the Institutional Review Board at Guangxi Police College, which ensured that all the procedures were ethical and that the rights of the participants were well protected.

3.3 Sampling Technique and Sample Size

The sampling strategy for this study was carefully designed to ensure representativeness and accuracy in both the quantitative and qualitative phases.

In Phase 1, a stratified random sampling method was employed to select participants from the target population of 673 graduates. These graduates were from the vocational speciality sections of the Judicial Application Faculty at Guangxi Police College. Utilising Krejcie and Morgan's formula (1970) for determining sample size, a sample of 248 participants was selected. The stratification was based on different majors, ensuring that the sample was representative of the diverse academic backgrounds within the faculty. This method was chosen to enhance the generalizability of the findings and to ensure that the results accurately reflect the experiences and satisfaction levels of the broader student population.

In Phase 2, a purposive sampling technique was used to select nine faculty members from the Judicial Application Faculty. These faculty members were chosen based on their experience and qualifications, specifically targeting those holding lecturer positions or higher and possessing at least a master's degree. This purposive sampling was essential for obtaining expert insights into the career planning process, as these faculty members are directly involved in guiding and mentoring students in their career development. The combination of stratified random sampling for students and purposive sampling for faculty members ensures a comprehensive and balanced approach to understanding the career planning process at Guangxi Police College.

3.4 Data Collection Procedure

Data collection for this study was conducted in two phases, corresponding to the quantitative and qualitative components of the research. In Phase 1, data were collected using a structured questionnaire distributed to the selected sample of graduates. The questionnaire was designed to assess various dimensions of student satisfaction with the career planning process using a 5-point Likert scale. To ensure broad participation and convenience, the survey was administered online. The Wen Juan Wang platform, with the link distributed through WeChat groups, was used to administer the survey. This method facilitated widespread participation and allowed for the efficient collection of data. The online platform also ensured that data were collected securely and efficiently managed for subsequent analysis. Phase 2 involved qualitative data collection through a focus group discussion with selected faculty members. The focus group was conducted online via Tencent Meeting, a popular and secure platform in China that allows real-time interactions despite geographical constraints. The session was scheduled for 60 minutes, during which faculty members discussed their perceptions of the current career planning process and offered suggestions for improvement. The discussion was recorded with participants' consent, and detailed transcriptions were produced for analysis. This combination of data collection methods allowed for a comprehensive understanding of the quantitative outcomes and the qualitative nuances of the career planning process at Guangxi Police College.

3.5 Scales or Measurements

The study utilised a well-structured 5-point Likert scale to measure students' satisfaction across various dimensions of the career planning process in Phase 1. The scale ranged from 1 to 5, with one representing "very dissatisfied" and five representing "very satisfied." This scale was selected based on its widespread use in educational research for measuring attitudes, perceptions, and satisfaction levels (Likert,

1932). The specific items on the questionnaire were designed to cover key aspects of career planning, including the availability of career resources, the effectiveness of career guidance, the relevance of career workshops, and the overall support provided by the college. The validity of the questionnaire was established through a rigorous review by a panel of three experts in the field of education, resulting in an Item Objective Congruence (IOC) index ranging from 0.67 to 1.00, indicating high content validity. The questionnaire items were subjected to a pilot test with 30 participants for reliability. The results showed strong internal consistency, with a Cronbach's α coefficient of 0.90, indicating that the items reliably measured the intended constructs. In Phase 2, the focus group discussion was analysed using thematic content analysis, allowing for the identification of key themes and patterns in the faculty members' responses. This qualitative approach complemented the quantitative measurements, providing a richer, more nuanced understanding of the career planning process and its effectiveness at Guangxi Police College.

3.6 Data Analysis Techniques

In this study, quantitative and qualitative data analysis methods were applied, corresponding to the two phases of the research. Quantitative data from the structured questionnaires in Phase 1 were analysed using SPSS, focusing on frequency distributions, means, and standard deviations to assess student satisfaction with various aspects of the career planning process. Cronbach's α was used to establish the reliability of the survey instrument, confirming high internal consistency. The results were presented in tables and charts to facilitate understanding.

In Phase 2, the qualitative data from the focus group discussion were analysed using thematic content analysis. The transcribed data were systematically coded to identify recurring themes and patterns related to the faculty members' perceptions of the career planning process. This approach allowed for extracting meaningful insights and recommendations, then integrated with the quantitative findings to provide a comprehensive understanding of the career planning process at Guangxi Police College. Combining these data analysis techniques ensured that the study's conclusions were grounded in empirical data and expert insights, providing a robust foundation for evaluating and enhancing the career planning process.

4. RESULTS AND ANALYSIS

4.1 Quantitative Method

Table 2 shows the survey included 248 participants where gender of the participants indicated about (n=144) 58.06% are female and 41.94% (n=104) are male participants. The Judicial Application Faculty, distinguished into the following categories: Legal Affairs (n=142), Legal Secretariat (n=16), Police Auxiliary (n=24), and Judicial Assistant (n=66). The demographic spread included 53% male and 47% female participants, ages 21 to 25.

Table 2. Demographic Information (N=248)

Item	Descriptions	Frequency	Percentage (%)
Gender	Female	144	58.06
	Male	104	41.94
Major Subject	Legal Affairs	132	53.23
	Police Auxiliary	102	41.13

	Legal Secretariat	07	2.82
	Judicial Assistant	7	2.82
Source of Career Planning	College Career Services	145	58.47
	Online Resources	195	78.63
	Peer Advice	133	53.63
	Books and Publications	97	39.11
	Workshops and Seminars Outside College	65	26.21
	Professional Career Counselors	61	24.6
Age Group	21-22 Years	92	37.1
	23-24 Years	111	44.76
	Above 25 Years	45	18.15

Figure 2 shows students' various sources for career planning, ranked by frequency and percentage. Online resources were the most popular, used by 78.63% (195) of students, followed by college career services at 58.47% (145). Peer advice was the third most common source, consulted by 53.63% (133) of students. Books and publications were used by 39.11% (97), while workshops and seminars outside college were utilised by 26.21% (65). Professional career counsellors were the least frequently used source, with only 24.60% (61) of students seeking guidance.
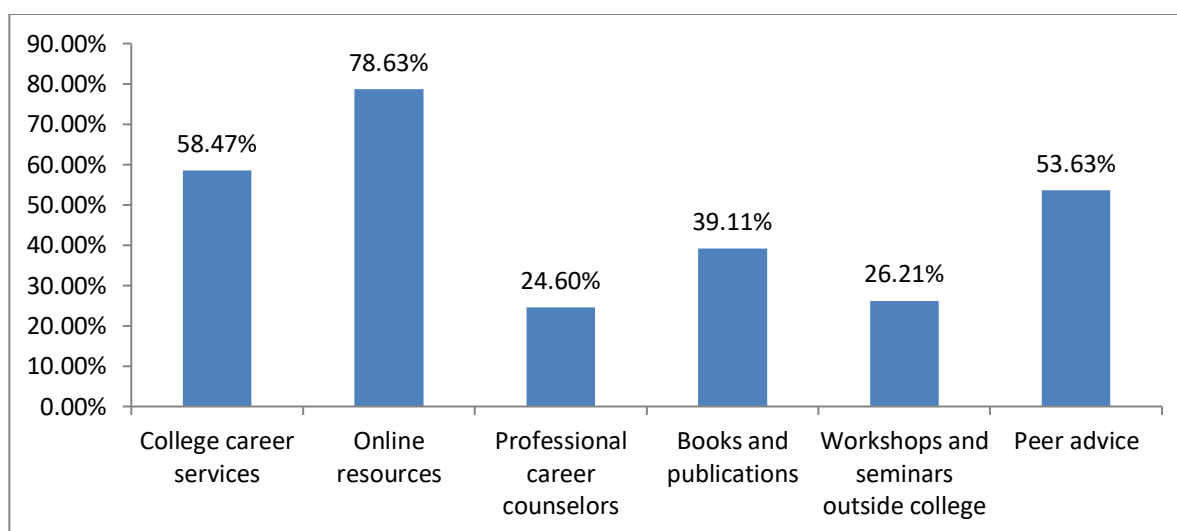
Figure 2. Career Planning

Table 3. Descriptive Analysis

Dimension	Mean	S.D.	Level	Rank
Self-Assessment	3.60	0.99	Satisfied	5
Goal Setting	3.62	1.01	Satisfied	4
Learning and Development	3.68	0.98	Satisfied	2
Career Exploration	3.68	1.00	Satisfied	3

Dimension	Mean	S.D.	Level	Rank
Integration and Application	.69	1.00	Satisfied	1

Table 3 presents a descriptive analysis of the dimensions related to career planning. "Self-Assessment" has a mean score of 3.60 with a standard deviation of 0.99, indicating a general level of satisfaction and ranking fifth. "Goal Setting" follows with a mean of 3.62 and a standard deviation of 1.01, ranked fourth in satisfaction. "Learning and Development" and "Career Exploration" share the same mean score of 3.68, with standard deviations of 0.98 and 1.00, ranking second and third, respectively. "Integration and Application" holds the highest satisfaction with a mean of 3.69 and a standard deviation of 1.00, ranking first overall. This analysis indicates that while all dimensions show a level of satisfaction, "Integration and Application" is perceived as the most satisfactory aspect. From the analysis of dimensions with special reference to career planning, 'Integration and Application' received a mean score of 3 to indicate the highest level of satisfaction. Out of 5, with a standard deviation of 1. 00 Participants rated 'Employment Services' as 3. 69, followed by 'Learning and Development' and 'Career Exploration' both with 3. 68. The two activities 'Goal Setting' and 'Self-Assessment' were lower having a mean of 3. 62 and 3. 60 respectively. In general, the overall satisfaction concerning all the assessed dimensions was moderately high with a mean value of 3. questioned, 64 (S. D. = 1. 00), which suggests that students were mainly satisfied with the career planning processes available to them.

Table 4. Correlation Matrix of Career Planning Dimensions

Dimension	Self-Assessment	Goal Setting	Learning & Development	Career Exploration	Integration & Application
Self-Assessment	1.	0.45	0.38	0.42	0.47
Goal Setting	0.45	1	0.51	0.48	0.5
Learning & Development	0.38	0.51	1	0.54	0.49
Career Exploration	0.42	0.48	0.54	1	0.53
Integration & Application	0.47	0.5	0.49	0.53	1.00

Table 4 presents the correlation matrix of career planning dimensions, revealing the interrelationships between five key components: Self-Assessment, Goal Setting, Learning & Development, Career Exploration, and Integration & Application. The diagonal values of 1.00 indicate perfect correlations within the same dimension, while off-diagonal values show the strength of relationships between different dimensions. Notably, Goal Setting demonstrates moderate correlations with all other dimensions, particularly Learning & Development (0.51). Similarly, Integration & Application exhibits a relatively strong correlation with Career Exploration (0.53) and Self-Assessment (0.47). The findings suggest that while all dimensions are interconnected, some relationships, such as Learning & Development and Career Exploration (0.54), are slightly stronger, emphasizing the complementary roles of these dimensions in career planning.

4.2 Qualitative Method

Nine faculty members from the Faculty of Judicial Application, all holding lecturer titles and master's degrees, were selected to ensure a diverse representation of experiences and perspectives within the academic unit. The selection process documented each participant's gender, educational background, work experience, and current position, recognising the group's diversity and depth of expertise. Tencent Meeting, a reliable and accessible online meeting platform, accommodated participants' schedules and facilitated a smooth discussion, as shown in Table 5 below.

Table 5. Basic Information of Focus Group

Participants	Gender	Education	Working Experience (years)	Position	Duration (minutes)	Platform
P1	Male	Master	6	Lecturer	60	Tencent Meeting
P2	Male	Master	5	Lecturer	60	Tencent Meeting
P3	Male	Master	5	Lecturer	60	Tencent Meeting
P4	Male	Master	18	Lecturer	60	Tencent Meeting
P5	Male	Master	20	Lecturer	60	Tencent Meeting
P6	Male	Master	10	Lecturer	60	Tencent Meeting
P7	Female	Master	12	Lecturer	60	Tencent Meeting
P8	Female	Master	20	Lecturer	60	Tencent Meeting
P9	Male	PhD	25	Professor	60	Tencent Meeting

Table 5 describes the demographical characteristics of focus group participants, showcasing the gender ratio, education level, employers, and experience of participants hailing from the Faculty of Judicial Application academic ranking. The study involved nine faculty members, of which there were seven males and two females. The participants held postgraduate qualifications, and their educational backgrounds were as follows: Eight held a master's degree, while the remaining held a Doctor of Philosophy degree. The participants' working experience varied from 5-25 years, which means that the participants could be experienced workers with different degrees of experience and seniority.

Regarding the proliferation of role representation, most participants were lecturers, and one participant worked as a professor. The focus group discussions were conducted online using the teleconferencing tool Tencent Meeting, which lasted 45-60 minutes to allow for a full exploration of opinions and recommendations. The study participants had different backgrounds. For instance, they had different years of experience, and their academic achievements differed. This made the study at Guangxi Police College diverse and dynamic.

Table 6 summarises the responses from a focus group discussion to identify areas for improvement in college processes, including self-assessment, goal setting, learning and development, career exploration, and integrating academic learning with practical applications. The focus group discussions revealed a strong desire for more dynamic and interactive elements within the college processes to better equip students for future careers. Themes such as enhancing real-world exposure, increasing digital integration, and fostering stronger industry collaborations were recurrent. Participants emphasised the need for continuous upgrading of career planning tools, increased support in overcoming personal and systemic barriers to goal setting, and more opportunities for practical application of learned skills. These insights can guide the college in refining its programs to better support student success in an ever-evolving professional landscape.

Table 6. Code from Focus Group

Question	Code	Responses from Participants (P1 - P9)
Self-Assessment: How could the college's self-assessment tools and processes be enhanced to better assist students in understanding and leveraging their professional strengths and weaknesses?	- Regular feedback and updates - Specific and measurable goal setting - External expert reviews - Alumni Engagement	P1: Emphasised the need for regular feedback and alums involvement. P2: Suggested setting specific, measurable goals. P3: Highlighted the importance of regular updates on student progress. P4: Agreed on the value of external expert reviews. P5: Mentioned that self-assessment tools should be tailored to individual students. P6: Focused on making self-assessment more interactive. P7: Supported increased alum engagement. P8: Emphasised personalised self-assessment feedback. P9: Highlighted the need for external evaluations.
Question	**Code**	**Responses from Participants (P1 - P9)**
Goal Setting: In your experience, what are the key obstacles preventing students from effectively setting and achieving their career goals, and how can the college better support them?	Enhancing self-awareness Addressing economic and familial pressures Curriculum improvements Increased parental engagement	P1: Stressed enhancing students' self-awareness. P2: Highlighted familial pressures as a significant obstacle. P3: Focused on curriculum improvements. P4: Suggested providing support to overcome economic challenges. P5: Proposed increased involvement of parents in career goal discussions. P6: Agreed on the need for increased parental engagement. P7: Highlighted how self-awareness affects goal setting. P8: Mentioned the importance of addressing familial pressures. P9: Discussed economic challenges and how they affect student goal setting.
Question	**Code**	**Responses from Participants (P1 - P9)**

Question	Code	Responses from Participants (P1 - P9)
Learning and Development: Given the current resources and programs, what additional tools or approaches could the college integrate to significantly boost students' personal and professional development?	- Enhanced real-world exposure - Utilisation of digital platforms for career support - Employer-student engagement	P1: Advocated for more real-world experience through internships. P2: Suggested increased use of digital platforms for career development. P3: Focused on enhancing employer-student engagement. P4: Agreed on the need for more real-world exposure. P5: Recommended integrating technology into career planning. P6: Supported digital platform utilisation. P7: Emphasised the importance of employer-student partnerships. P8: Suggested a stronger focus on real-world projects. P9: Proposed additional industry collaborations.
Question	**Code**	**Responses from Participants (P1 - P9)**
Career Exploration: What changes or additions to the career exploration opportunities offered by the college do you believe would most benefit students in understanding and navigating diverse career paths?	- Expanded real-world experiences - Practical simulations (AR) - Community engagement - Entrepreneurial support	P1: Emphasized community engagement and real-world experiences. P2: Proposed practical simulations like AR. P3: Supported entrepreneurial initiatives. P4: Highlighted the need for community involvement. P5: Advocated for practical career exploration tools like AR. P6: Suggested more real-world career simulations. P7: Focused on entrepreneurial support. P8: Emphasised expanding practical experiences. P9: Highlighted the value of community engagement in career exploration.
Question	**Code**	**Responses from Participants (P1 - P9)**
Integration and Application: From your perspective, what strategies could the college implement better to integrate academic learning with practical, real-world applications to	- Practical application of academic learning - Digital and real-world integration - Enhanced industry-academia partnerships	P1: Suggested creating stronger industry-academia partnerships.

enhance students' readiness for the job market?	P2: Focused on integrating digital tools with real-world applications.
	P3: Recommended practical applications of academic knowledge in industry.
	P4: Supported the integration of academic learning with hands-on experience.
	P5: Proposed more practical, industry-focused projects.
	P6: Emphasised the need for digital integration.
	P7: Supported enhanced partnerships between industry and academia.
	P8: Suggested integrating academic work with practical applications in the job market.

Table 6 reveals that the results correspond to the key suggestions collected based on the focus group discussions among some of the teaching staff of Guangxi Police College. The reference to the answers was sought concerning different aspects of career planning, which are self-assessment, the practices introduced by the faculty, feedback offered on a routine basis, specific goal setting, external expert evaluation, and alums involvement. This will enable the students to know and appreciate their areas of strength and weaknesses. In goal setting, the faculty enumerated some challenges, such as the concept of self, economic pressure, family pressure, course development and change, parent involvement, and students' employment. While discussing learning and development, the highlighted factors were the lack of experiential learning, web-based career support services, and weak employer involvement. Regarding career exploration, the changes proposed by faculties included the need to increase real-world experiences, the use of realistic scenarios and simulations, campus opportunities, and support for entrepreneurial careers, with a need to widen out career options for students.

5. DISCUSSION

The findings drawn from this study identify the current status of career planning at Guangxi Police College and the current opportunities and challenges, and in doing so, outline the study's key findings. In the quantitative study results, students are generally satisfied with the proportion of career planning services offered by the college, as exhibited by an average satisfaction score of 3. On average, students who perceived satisfaction in career-planning strategies were 64 out of 100 on a five-point Likert scale. In more detail, all four dimensions received above-average validation by participants – the highest mean scores were recorded for the instructions and applications, learning and growth, and career investigational dimensions. Thus, the results indicate that the college might have effectively introduced essential conceptual components of career development, thereby supporting prior empirical studies that point to the basic building blocks in career preparation (Liu, 2020). However, they also reveal areas that have been left with deficiencies and need to be addressed. Self-assessment and goal setting, being in the 'satisfied' zone, was slightly lower, suggesting the need for further examination of the college's efficiency in aiding learners in recognising their areas of capabilities and infirmities as well as identifying realistic career objectives. This

concurs with prior research-based investigation that stresses the centrality of sound self-evaluation techniques and measurable objective-setting interventions as the main building blocks to effective career development (Brown & Lent, 2020; Yanni & Khairani, 2020). The slightly lower satisfaction scores indicate that although the college is moving in the right direction, some areas still need improvement, especially in the areas of feedback. Feedback should be focused on helping the students improve their future performance.

The quantitative findings also support these results, while the focus group discussions provide the faculty's view of the problems and possibilities tied to the current state of the career planning process. To improve the self-assessment process, the faculty members recommended that more frequent feedback and updates on students' progress, the involvement of outside experts in the assessment processes and alumni engagement can be helpful. These recommendations are consistent with the literature supporting that state and commonplace-based assessments should be formative and external to students' courses (Chen, 2003). Regarding students' goals, faculty observed that economic realities and family constraints limited students' career goals. This finding supports prior studies that examined the effects of extrinsic barriers – stress, pressure from family members or friends, and budget limitations on the choices students make in a career path (Foshaugen, 2023; Holland, 1997). The recommendations to develop the curriculum and enhance parents' involvement as strategic stakeholders also presuppose the recognition of the fact that the career development of students cannot be considered a process devoid of the context of the socio-economic environment.

Other valuable areas of concern are learning, development and career exploration. As for the practitioners, they stressed the accessibility of real-life practice as well as the employment of technology to advance careers, which coheres with the trends existing in the higher education system for integrating the practice and technology in career services (Xue, 2023; Wang et al., 2023). The argument for improved relations between employers and students, more opportunities for actual practice and expanded choice of disciplines indicate that college has made a fair amount of contribution regarding these issues but still needs to do more to prepare the students for the actual work and to introduce them to a greater variety of occupations. The aims of integration and application also explored the lack of collaboration between industries and academic institutions and the practical uses of academic education. This aligns with literature that calls for strong ties between academics and human resource departments to make personnel market-worthy (Liu, 2020).

5.1 Practical Implications

This study has provided insight into the following pragmatic implications concerning advancing the career planning process at Guangxi Police College and other similar educational institutions. Concerning the areas highlighted in the quantitative and qualitative studies, the college can employ specific measures to enhance the effectiveness of the career planning services to prepare students for future careers in law enforcement agencies. Firstly, the research yields a requirement for higher authenticity in the form of self-assessment instruments that give feedback to the students more frequently with a specific focus on their areas of strength and difficulty. Secondly, and perhaps unexpectedly coming from the faculty, there was a concern for external forces like essential life decisions such as marriage and career choices. They can pose challenges when it comes to adopting career planning strategies. To minimise such challenges, the college must bring workshops or counseling sessions on handling and integrating such pressures into their student achievement plans.

Furthermore, higher parental involvement in the student's career planning could positively influence the student's career choice in congruence with the parents' expectations and thus increase the parent's support for the student's career decisions. Thirdly, internships, practical simulations and IT industry linkage are recommended for the students to improve their education through exposure to real-life training.

6. CONCLUSION AND RECOMMENDATIONS

This study aimed to assess and enrich the career development planning process of GPC (Guangxi Police College) and recognise major key points through the mixed-methods research approach. The study indicates that the overall satisfaction with the career planning services offered by the college is relatively high. However, some gaps should be strengthened to provide optimum support to the students concerning their careers. Areas like Integration and Application, Learning and Development, and Career Exploration are nearly innovatively developed, which ensures that the college offers the proper foundation for career development for the students. Nonetheless, results for specific areas such as Self-Assessment and Goal Setting are only satisfactory as improvement is still needed, especially in providing more individualised feedback and the ever-prevailing outside pressure that shapes students' career-related career-related decisions. The qualitative findings from the self-administered questionnaires completed by faculty members support these findings and generate practical suggestions for enhancing the career development process. The areas with suggested improvements of efficacy were the frequency and purpose of the feedback given to learners, the addition of external evaluations and assessments, and the enhanced parental and alums involvement as approaches that would help learners identify their respective strengths and set realistic goals concerning their future careers.

6.1 Limitations and Future Research

Despite the findings of this study shedding light on the career planning process at Guangxi Police College, several limitations must be highlighted. Firstly, it may be credited to the study design, which examined subjects belonging only to one institution, making greater generalizability of results less likely. While the results provide a clear picture of the situation in which Guangxi Police College operates, its strengths, weaknesses, and opportunities in terms of career planning may not be generalisable to other police colleges or universities in other areas or countries. Further studies could help overcome this limitation by using cross-sectional research designs to establish variations and differences in career development across different institutions, given comparable learning environments.

It should be noted that the study design used in the present research does not allow for tracing the actual process of evolving career planning and tendencies in students' career orientation in the long term. Career development is a fluid and dynamic process, with students transitioning from one learning level to another and from the learning institution into the workforce. Future research could use a longitudinal design to intermediate the results of the dynamics in students' career planning needs and the consequences they produce on career results. It also gives a broader perspective on the efficacy of career planning interventions and enables recognition of particular eras in learners' education where they could benefit from extra assistance.

REFERENCES

Arhipova, O., & Kokina, I. (2022). Managers' self-development in the context of career growth. *Society. Integration. Education: 1.* In *Proceedings of the International Scientific Conference*, (pp. 698-709). Rezekne Academy of Technologies.https://doi.org/10.17770/sie2022vol1.6847

Betz, N., & Hackett, G. (2006). Career self-efficacy theory: Back to the future. *Journal of Career Assessment, 14*(1), 11-3. https://doi.org/10.1177/1069072705281347

Brown, S. D., & Lent, R. W. (Eds.). (2020). *Career development and counselling: Putting theory and research to work* (3rd ed.). John Wiley & Sons

Chen, C. P. (2003). Integrating perspectives in career development theory and practice. *Career Development Quarterly, 51*(3), 203-216. https://doi.org/10.1002/j.2161-0045.2003.tb00602.x

Dasheng, D., Guangxi, H., & Yandong, Z. (2013). *Parents' occupational expectations of primary and junior high school students and influencing factors.* In Chinese Research Perspectives on Society, vol. 1 (pp. 139-153). Brill. https://doi.org/10.1163/9789004246249_010

Egerău, A. (2017). Professional integration and career development - Between necessity and reality. *Journal Plus Education, 19*(1), 66-76. https://doi.org/10.24250/jpe/1/2018/ae

Fauzana, I., Afdal, A., & Yusuf, A. M. (2021). Strategies to improve career planning for middle school students. Indonesian *Journal of School Counseling, 6*(2), 140-148.

https://doi.org/10.23916/08934011

Feifei, M., Jiawei, X., & Ming, Y. (2023). A study on the correlation between professional satisfaction and career choice tendency of police college students. *Advances in Vocational and Technical Education*, *5*(3), 53-60. https://doi.org/10.23977/avte.2023.050309

Foshaugen, R. H. (2023). *Perceptions of guanxi: To what extent do Chinese graduates have to rely on guanxi to find a job?* [Master's thesis, University of Oslo]. http://hdl.handle.net/10852/104581

Guo, Q., An, X., & Zhou, H. (2019). Construction of practice education mode of anti-terrorism speciality in police colleges. In *2019 5th International Conference on Social Science and Higher Education (ICSSHE 2019)* (pp. 350-353). Atlantis Press. https://doi.org/10.2991/icsshe-19.2019.211

Hani, H. Y., Mulawarman, M., & Wibowo, M. E. (2021). The effectiveness of life skill education-based digital content to improve student career planning. *Jurnal Bimbingan Konseling, 10*(1), 49-53. https://doi.org/10.15294/jubk.v9i1.45410

Hassan, H., Hussain, M., Niazi, A., Hoshino, Y., Azam, A., & Kazmi, A. S. (2022). Career path decisions and sustainable options. *Sustainability, 14*(17), 1-16. https://doi.org/10.3390/su141710501

Holland, J. L. (1997). *Making vocational choices: A theory of vocational personalities and work environments (3rd ed.)*. Psychological Assessment Resources, Odessa.

Jie, H. (2024). *Organisational factors contributing to college students' leadership development: A case of the higher educational institutions in Guangxi Zhuang autonomous region, PRC* (Doctoral Dissertation, The Graduate School). Siam University. https://e-research.siam.edu/

Khoso, A. K., Darazi, M. A., Mahesar, K. A., Memon, M. A., & Nawaz, F. (2022). The impact of ESL teachers' emotional intelligence on ESL students academic engagement, reading and writing proficiency: Mediating role of ESL student's motivation. *International Journal of Early Childhood Special Education (INT-JECSE)*, *14*(1), 3267-3280. https://doi.org/10.9756/int-jecse/v14i1.393

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Kuijpers, M., Meijers, F., & Gundy, C. (2011). The relationship between learning environment and career competencies of students in vocational education. *Journal of Vocational Behavior, 78*(1), 21–30. https://doi.org/10.1016/j.jvb.2010.05.005

Lavankura, P. (2013). Internationalising higher education in Thailand. *Journal of Studies in International Education, 17*, 663 - 676. https://doi.org/10.1177/1028315313478193

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior, 45*(1), 79-122. https://doi.org/10.1006/jvbe.1994.1027

Li, W., & Huangfu, C. (2015). Career planning mode and system design of first-year university students. In *Proceedings of the 2015 International Conference on Social Science and Technology Education,* [Series: Advances in Social Science, Education and Humanities Research]. Atlantis Press. https://doi.org/10.2991/icsste-15.2015.241

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, 22*(140), 55-60. https://psycnet.apa.org/record/1933-01885-001

Litynska, V. (2023). Career planning for employees of higher education institutions. *Educational Analytics of Ukraine* [Higher Education]*, vol. 2023*(1), 67-78. https://doi.org/10.32987/2617-8532-2023-1-67-78

Liu, D. (2020). The role of social capital/guanxi in students' decision-making about postgraduate education in China: An explorative case study. *Frontiers of Education in China*, *15*(3), 453-481. https://doi.org/10.1007/s11516-020-0019-3

Ma, M. X. (2014). *Antecedents of entrepreneurial career choice among Chinese college students* [Doctoral dissertation, The Chicago School of Professional Psychology]. ProQuest Dissertations and Theses.

Raabe, B., Frese, M., & Beehr, T. A. (2007). Action regulation theory and career self-management. *Journal of Vocational Behavior, 70*(2), 297-311. https://doi.org/10.1016/J.JVB.2006.10.005

Sampson, Jr. J. P., Reardon, R. C., Peterson, G. W., & Lenz, J. G. (2004). *Career counselling and services: A cognitive information processing approach* (*Graduate career counselling series) (1st ed.).* Brooks Cole.

Sari, R. R., & Dwiarwati, K. A. (2023). Spinning media as an information service to improve student career planning. *Bisma The Journal of Counseling, 7*(1), 122-129.https://doi.org/10.23887/bisma.v7i1.58922

Savickas, M. L. (2005). *The theory and practice of career construction.* In S. D. Brown & R. W. Lent (Eds.), Career development and counselling: Putting theory and research to work (pp. 42–70). John Wiley & Sons.

Shen, A. (2022). Women's motivations for becoming a police officer: A Chinese case study on women in policing. *Women and Criminal Justice*, 34 (6), 438-453. https://doi.org/10.1080/08974454.2022.2060898

Sîrbu, J., Popa, M. C., & Pipas, M. D. (2014). Professional career planning - Practice and results. *The International Journal of Academic Research in Business and Social Sciences, 4*(7), 350-362. https://doi.org/10.6007/ijarbss/v4-i7/1014

Tang, H. (2019). Research on improving graduates' information literacy of "mass entrepreneurship and innovation" under the era of "internet plus smart she" takes the poor female college students of Hunan Judicial Police Vocational College as an example. In *3rd International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2019)* (pp. 1419-1423). Atlantis Press. https://doi.org/10.2991/iccese-19.2019.314

Tian, F. F., & Chen, L. (2018). Unequal at the college door: Career construction among first-year students at an elite Chinese university. *International Journal of Sociology and Social Policy*, *38*(11/12), 1041-1056. https://doi.org/10.1108/ijssp-03-2018-0050

Umar, N. F. (2021). Digital career planning models for Z Generation. *Indonesian Journal of Educational Studies, 23*(2), 91-100. https://doi.org/10.26858/ijes.v23i2.18935

Volchenkova, E. V., Voronina, O. A., Tursenev, S. A., Bugaychuk, T., & Koryakovtseva, O. (2022). Formation of career strategies for students with health limitations and disabilities at the stage of vocational training at university. *Perspectives of Science and Education, 5*(59), 377-396. https://doi.org/10.32744/pse.2022.5.22

Wang, X. H., Wang, H. P., & Lai, W. Y. (2022). Sustainable career development for college students: An inquiry into SCCT-based career decision-making. *Sustainability*, *15*(1), 426. https://doi.org/10.3390/su15010426

Wang, X. H., Wang, H. P., & WenYa, L. (2023). Improving the quality of career decision-making of students in Chinese higher vocational colleges. *Sage Open*, *13*(2). https://doi.org/10.1177/21582440231180105

Xue, Y. (2023). *Study on the relationship between family background and career adaptability of fresh graduates: A case of Qingdao Urban Development Group* [Doctoral dissertation, Siam University]. https://e-research.siam.edu/

Yanni, D., & Khairani, K. (2020). Career planning in vocational high school. *Jurnal NeoKonseling*. *3*(1). https://doi.org/10.24036/00373kons2021

Yang, L., & Wong, L. P. (2020). Career and life planning education: Extending the self-concept theory and its multidimensional model to assess career-related self-concept of students with diverse abilities. *ECNU Review of Education, 3*(4), 659-677. https://doi.org/10.1177/2096531120930956

Zhang, C., Lu, L., Xiao, Y., Zheng, Z., Jia, Q., Luo, Y., & Luo, J. (2024). From the three-dimensional perspective of college students' school, family and themselves, exploring the mechanism of proactive personality on career exploration. *International Journal for Educational and Vocational Guidance*, 61 (1), 1-22. https://doi.org/10.1007/s10775-024-09681-8

The Implementation Effect, Blocking Factors and Relief Paths of The Policy on Cultivating New Professional Farmers Based on The Perspective of Policy Network Theory

Yongcai Li[1], Lei Shen[2], Mo Wang[3*]

[1-3]Guizhou Vocational and Technical College of Water Resources and Hydropower, Guiyang, China

[2]Yunnan Normal University, Yunnan, China

Article Information	ABSTRACT
    Corresponding Author: Mo Wang 290020466@qq.com	This study examines the effectiveness of policies aimed at cultivating new professional farmers in East China, with a particular focus on the role of government support, stakeholder collaboration, and the challenges faced during the implementation of training programs. The aim of the study was to critically assess the impact of these training initiatives and identify key factors that influence their success. A qualitative case study approach was employed, using secondary data analysis of government reports, academic studies, and local evaluations. The findings revealed that while government policies provided a strong framework for agricultural modernization, the success of training programs was impeded by insufficient local resources, fragmented stakeholder collaboration, and farmers' reluctance to adopt new farming techniques. Additionally, the quality of training varied significantly across regions, limiting the program's effectiveness. The study concludes that the full potential of these training programs can be realized through enhanced stakeholder collaboration, localized policy implementation, and addressing resource and motivation barriers. The implications for policy include the need for more tailored, region-specific strategies, greater investment in infrastructure, and improved coordination between stakeholders to ensure the sustainability and inclusivity of the training initiatives. **Keywords:** New Professional Farmers; Government Policies; Agricultural Training; Stakeholder Collaboration; Policy Implementation; East China

1. INTRODUCTION

The innovative practices in agricultural transformation in East China focus on the new professional farmer training model and highlight that the model enhances farmers' technical skills, entrepreneurial capacities, and adaptability to modern agricultural demands (Chen, 2025). The focus on promoting sustainable development through integrating advanced training methods, policy support and stakeholder collaboration highlights the transformative potential of these initiatives in modernizing agriculture that enhances rural livelihoods, tackling issues such as inconsistent implementation and resource limitations (Meng et al., 2024). New professional farmers play a crucial role in driving agricultural modernization and rural revitalization strategies, making them key contributors to the broader goal of the significant regeneration of the Chinese nation. Their impact ranges from individual employment to ensuring the "vegetable basket" security at the societal level (Liu et al., 2022).

Bist et al., (2024) addressed that new professional farmers can be distinguished from traditional farmers by their updated technical skills, development concepts that align with modern needs, and agricultural production management strategies. These new characteristics are not solely derived from the title or spontaneously formed in social practice; they require external support for their development, as farmers face certain limitations in self-transformation (Maas et al., 2021). In this way, Akintuyi (2024) proposes that cultivating new professional farmers involves transforming and reshaping traditional or potential farmers. Therefore, the significance of cultivating new professional farmers is as crucial as the farmers' value. At the practical level, both central and local governments have issued key documents to promote the cultivation of new professional farmers; in this regard, the Ministry of Agriculture launched the Pilot Work Plan for Cultivating New Professional Farmers, initiating a nationwide pilot program.

Based on practical experience, Qin et al. (2022) argued that the Ministry issued the 13th Five-Year Plan for the Cultivation and Development of New Professional Farmers in 2017, aiming to increase the number of new professional farmers to over 20 million by 2020. Every year thereafter, Central Document No. 1 introduced further requirements and measures for cultivating new professional farmers (Liao et al., 2022). Locally, governments have issued policies aligned with central guidelines but tailored to regional needs. For instance, in 2015, Guangxi implemented a new professional farmer training project through its "10+3" characteristic in the agricultural industry (Karunathilake et al., 2023). In 2017, Heilongjiang established a "one-main-multiple-partner" education and training system, with farm radio and television schools (farmers' science and technology education centers) as the core, supported by agricultural vocational colleges and other local institutions (Zhang et al., 2024). Under a relatively complete policy system, China's new professional farmer training has achieved notable results. First, the number of new professional farmers has skyrocketed. Second, the structure of the latest professional farmer team has progressively improved. Third, the industrialization level of new professional farmers has continuously advanced, but challenges in the training process remain concerning (Sharma et al., 2022).

Regarding China's new professional farmer training, farmers lack endogenous motivation to participate in training. Factors such as perceived risks and time costs deter farmers from engaging in social training programs (Mizik, 2023). Moreover, some enterprises and training institutions exploit the situation for profit by engaging in fraudulent practices such as enrolling participants without providing actual training. Yin (2020) argued that training resources for new professional farmers are relatively scarce. An inadequate teaching staff makes it challenging to address the dual needs of theoretical and practical training. It also highlighted that the current implementation of the new professional farmer policy does not fully align with the established goals, and there are significant challenges in the execution process. Theoretically, experts and scholars have conducted multi-dimensional discussions on the new professional farmer training policy (Lu et al., 2021) and focus on policy changes for new professional farmers traced the evolution of farmer training policy. It recognized that the training of new professional farmers is the latest phase in the farmer training policy reform. Besides this, a need to concentrate on the core issue of individual development in the context of these policy changes.

Yin (2020) has examined the impact of income expectations and environmental perceptions on the effectiveness of the latest professional farmer training policy through behavioral economics and utilized the Office of Management and Budget (OMB) tool to develop an evaluating index system for assessing the implementation of this policy.

Zhang et al., (2024) explored the performance evaluation and improvement strategies for the policy using the Context Input Process Product (CIPP) evaluation model. Zhao et al., (2019) focused on the policy goals of the new professional farmer training initiative and analysed practical problems and optimisation strategies for new professional farmer training in China from the perspective of the policy goals of the program to assess the current state of new professional farmer initiatives. They often focus excessively on the policy by examining the interactive relationships between stakeholders during its implementation and underlining the unexplored challenges. The new professional farmers encompass several central and local departments vertically and engage individuals and other social groups horizontally. The interactions among these subjects are intricate and interconnected, corresponding with the fundamental attributes of policy networks to examine the relationships among various subjects and their dynamics during the execution of the new professional farmer policy. It can assess policy efficacy, identify implementation obstacles, and provide remedies. Such an analysis is critical for developing a more appropriate policy for training new professional farmers and encouraging high-quality agricultural development. Study objectives are listed as;

1. The effectiveness of current policies for cultivating new professional farmers.
2. The key challenges faced in the policy implementation process.
3. The role of policy networks in addressing these challenges and enhancing the policy's effectiveness.
4. Propose solutions for improving the current framework and ensuring high-quality agricultural development.

The study focuses on applying policy network theory to the agricultural context in East China, particularly regarding the cultivation of new professional farmers. It focuses on the interactions among various stakeholders (Government networks, producer networks, professional networks, and others). Evaluating policy outcomes provides a fresh perspective on policy evaluation and improvement and identifies the structural dynamics and challenges that affect the overall implementation. It offers a more comprehensive and nuanced understanding of the policy's success and limitations.

2. THEORETICAL BASIS AND APPLICATION ANALYSIS

2.1 Network Theory of Policy Implementation

Policy implementation is the critical process that transforms policy ideals into reality, making it a cornerstone of the entire policy cycle. Despite its significance, theoretical research on policy implementation has lagged behind other stages, including policy formulation. Papamichail et al. (2023) argued that Western academia focused on the policy implementation movement, particularly in the United States. The classical administrative model influences it and focuses on administrative organizations and their activities, leading to a "top-down" approach that examines the flow of actions from policymakers to administrative officials—further proposed that the evolution of democratic politics highlighted the limitations of the classical administrative approach (Liu et al., 2023). Policy implementation increasingly relies on the participation of various social organizations and individuals, shifting the focus towards a "bottom-up" model and exploring how non-policymakers influence the implementation process, emphasizing the roles and tensions among diverse stakeholders (Zhao, 2022). Zhelyazkova et al., (2024) provide insightful information about numerous facets of policy implementation and capture the unique features of policies across time.

The complex relationships between various actors cannot be adequately explained by either the "top-down" or the "bottom-up" approaches. Policy network theory developed as a result of this gap provides a more thorough framework for examining the interactions of various actors in policy implementation (Alias et al., 2021). Policy network theory emerged in the United States during the 1950s and has been continuously refined and expanded. It explains the policy process within the context of heterogeneous and fragmented interactions between the state and society (Zhang et al., 2024). According to the contributions of Rhodes & Marsh (1992), policy network theory has become a key framework for analyzing multiple policy actors and their complex interactions, as it emphasizes the relationships between actors in the policy network, including correlation, dependence and complexity. They further proposed that policy networks are categorized into five distinct types: policy community, professional network, intergovernmental network, producer network, and issue network. While policy network theory addresses the overall policy process, it equally applies to policy implementation analysis.

This applicability stems from two key factors. First, policy and implementation share a "process" characteristic while focusing on the interaction and relationships between policy actors and explicitly highlighting the dynamics and tensions between various execution agents. Second, as societal values diversify and governance structures evolve, the traditional "top-down" or "bottom-up" implementation models have proven insufficient for many aspects of policy implementation, which now exhibit network-like characteristics. Thus, employing policy network theory offers a more accurate and comprehensive explanation of modern policy implementation processes.

2.2 The Implementation of Network Policy on Cultivating New Professional Farmers

Cultivating new professional farmers represents an advanced form of farmer education in the modern era. Within learning villages, it has become a significant component of adult and lifelong education (Rust et al., 2022). The participants in the cultivation process have expanded from a traditional bilateral relationship between the Government and rural vocational schools to a diversified framework that includes governments, vocational schools, enterprises, and other institutions. Additionally, the scope of cultivation now spans multiple dimensions, including politics, economy, and culture, highlighting its cross-border and symbiotic nature (Zhong & Ferrand, 2022).

The policy implementation network for cultivating new professional farmers consists of vertical interactions between central and local governments and horizontal connections among social organizations and individuals, resulting in a complex web of interconnected relationships among numerous parties. Initially, each participant engages in activities compatible with the policy and regularly uses shared resources to interact. However, differences in the interests of diverse stakeholders can result in uneven policy implementation intentions and, in some cases, competing goals. Using the policy network analysis model (dialectical model) proposed by Rhodes & Marsh (1992), the structure of the policy implementation network for new professional farmer training reflects this complexity, which is illustrated in Figure The policy implementation network for cultivating new professional farmers is structured into several interconnected layers, each with distinct roles and responsibilities (Guo et al., 2022). The policy community is at the heart of the network, and it encompasses the Party's and the State's most powerful agencies, such as the Central Government, the Ministry of Education, and the Ministry of Agriculture and Rural Affairs. These entities have relatively stable, interdependent, and cooperative interactions.

As the most authoritative members of the policy network, they are responsible for the top-level design and supervision of the new professional farmer policy (Du et al., 2021).
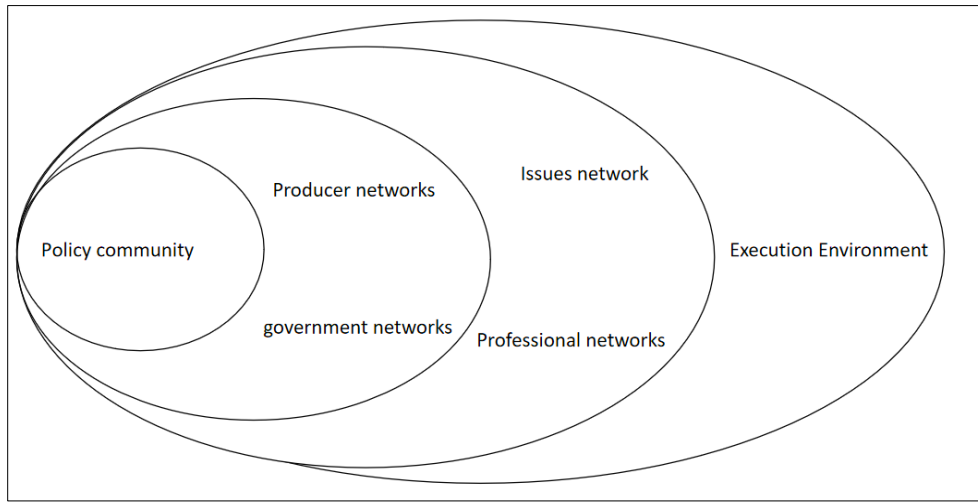
Figure 1. Network structure of the policy implementation of new professional farmers training (Rhodes & Marsh, 1992)

The inter-governmental networks and producer networks form the next layer, located at the center of the network. It includes local Government departments below the provincial level, such as those managing education, rural agriculture and finance (Zhong & Ferrand, 2022). These entities interpret central policies, transform them into executable local plans and implement them using their organizational resources. Their internal cooperation is critical in the determination of effective policy implementation. The producer network comprises key practitioners, including secondary and higher vocational colleges, enterprises, institutions, industry associations, and other organizations (Liu et al., 2023).

These stakeholders provide essential training resources, such as educators, courses, teaching venues, and skill-development equipment. On the periphery of the network are the professional networks and issue networks. These include experts, scholars, and academic groups that address challenges in cultivating new professional farmers, provide recommendations, and contribute to policy development due to their high level of expertise and significant professional qualifications. On the other hand, the issue network comprises a diverse range of social individuals and organizations interested in the policy, such as social media platforms, potential farmers, and the general public. It has the broadest spatial distribution and the largest membership and frequently provides suggestions on policy implementation through channels like social media, books, and newspapers. However, their dispersed nature and relatively low influence limit their ability to shape policy discourse.

Implementing the policy for cultivating new professional farmers operates within a broader implementation environment, where a "center-edge" logical relationship defines the connection between the policy network and its outcomes. Most entities in the network play many functions in a dynamic structure of interdependence and competition for interests. The interactions between these network elements substantially impact the success of policy execution.

3. METHODOLOGY

The study adopted a qualitative research design to investigate the implementation of policies for cultivating new professional farmers in East China. It focuses on the challenges faced and the role of policy networks in addressing these issues. The research aims to uncover the fundamental dynamics between various stakeholders, understand the effectiveness of current policies and explore the interactions that influence policy outcomes. Despite the complexities of policy networks, a thematic analysis approach will be used to extract patterns and significant themes from the data. It will result in a more comprehensive knowledge of the policy implementation process.

3.1 Research Design

The qualitative research design thoroughly examines the policy implementation procedures for developing new professional farmers in East China. It explores policy implementation's context-specific dynamics and complexities of real-world settings. It also analyzed the factors influencing policy outcomes by focusing on specific regions implementing significant policy initiatives, such as the "Pilot Work Plan for Cultivating New Professional Farmers" and local government-led training programs. It also provided a method of understanding policy implementation, the challenges faced, and the interactions among various stakeholders within the policy networks.

3.2 Data Collection

The study collected data primarily through secondary data analysis, examining existing documents and reports on cultivating new professional farmers. The primary data sources included Government policy documents such as the "13th Five-Year Plan for the Cultivation and Development of New Professional Farmers," Central Document No. 1, and other relevant local Government publications outlining the policies and strategies for farmer training. Reports from agricultural institutions, local Government evaluations, and academic studies were reviewed to evaluate the impact of the policies and to gain a broader understanding of the challenges faced during implementation, as these sources provide valuable insights into the goals, objectives, and implementation strategies outlined by the Government and the real-world outcomes of these policies. The study can construct a comprehensive picture of the policy landscape and the effectiveness of the new professional farmer training initiatives across different regions to draw upon the collective knowledge and evaluations already available in the field. Table 1 shows the data source of the literature

Table 1. Data collection

Aspect	Details
Data Collection Method	Secondary Data Analysis
Time Frame	2012-2023 (covering multiple years of policy implementation)
Data Sources	1. Government Policy Documents (e.g., '13th Five-Year Plan', Central Document No. 1)
	2. Local Government Reports
	3. Agricultural Institution Reports
	4. Academic Studies and Evaluations
Included Data	1. Government Policy Documents outlining objectives and strategies
	2. Reports and evaluations of training program impact
	3. Academic research on policy implementation

	1. Primary Data (interviews, surveys, direct observations)
Excluded Data	2. Documents not publicly available or not relevant to the research questions
Purpose of Data Collection	To assess the effectiveness of new professional farmer training policies, explore policy implementation challenges, and analyze the impact of various policies and strategies

3.3 Data Analysis

The secondary data were analyzed using thematic analysis to identify recurring themes and patterns across diverse data sources. It determines essential policy matters, implementation obstacles, and stakeholder activities within policy networks. It also reviews the data to gain familiarity before conducting text segment coding from reports, documents, and evaluations. The initial codes underwent categorization to present themes that conveyed key elements of the research questions about Government backing, obstacles to farmer participation, and training program successes. They also focused on examining and refining these initial themes to confirm that they precisely captured the study data while delivering significant findings. They obtained detailed insights regarding the connections between participants who executed the policy and an in-depth analysis of policy challenges and successes, resulting in recommendations to improve the policy framework. It also developed final themes with specific sub-themes, while documents included supporting quotes for verification purposes.

3.4 Ethical Considerations

Secondary data analysis comprised the primary research methodology, but ethical considerations remained an important operational element throughout the investigation. Analysis of second-order data eliminated potential issues with participant approval and data secrecy requirements. It is verified that every document included in the analysis was available in the public domain or authorized with official permission from the proper governing bodies. When documents contain personal data or sensitive information, the researcher takes appropriate measures to de-anonymize content before treating it with extreme caution to prevent breaches of ethics. All reports, alongside academic articles and documents, received credited authorship from their original creators through precise citation methods. The process-maintained research integrity while maintaining compliance with academic research ethics. Throughout the analysis, the study presented results while upholding constant ethical responsibility toward protecting individual and institutional privacy.

4. RESULTS AND DISCUSSION

4.1 Overview of Themes

The secondary data analysis revealed several key themes that offer valuable insights into the implementation and impact of policies designed for cultivating new professional farmers in East China through the thematic analysis of Government reports, academic studies and local evaluations. The primary themes that emerged are the significance of Government support and policy frameworks in establishing training programs, the barriers encountered in accessing and participating and the effectiveness of training in enhancing farmers' technical and entrepreneurial skills. Moreover, the stakeholder collaboration highlighted the complex interactions between Government agencies, agricultural institutions and local communities, along with barriers to successful implementation, such as resource constraints, lack of qualified trainers, and insufficient farmer motivation, which emerged as a critical theme.

They also discussed the policy's successes, limitations, and the factors influencing its outcomes. It offers insights into how policy can be enhanced to develop new professional farmers in China. Table 2 shows the Theme identified in the literature

Table 2. Identified Themes

Theme	Description
Role of Government Support and Policy Frameworks	This theme explores how government policies, frameworks, and support structures shape the design and delivery of farmer training programs, influencing their effectiveness.
Challenges Faced by Farmers	This theme highlights the difficulties faced by farmers in accessing and engaging with training programs, including time constraints, lack of awareness, and perceived risks.
Effectiveness of Training	This theme assesses the outcomes of training programs in enhancing farmers' technical and entrepreneurial skills, and their ability to adapt to modern agricultural demands.
Stakeholder Collaboration	This theme examines the complex interactions between key stakeholders, including government agencies, agricultural institutions, and local communities, and how these collaborations impact the success of the policy.
Barriers to Successful Implementation	This theme identifies the key challenges in policy implementation, including resource constraints, lack of qualified trainers, and insufficient farmer motivation to participate in training.

4.2 Role of Government Support and Policy Frameworks

Government-supported policy frameworks remained the central dynamic since state-led initiatives opened routes for new professional farmers to grow. Changes to Government policies, including the "13th Five-Year Plan for the Cultivation and Development of New Professional Farmers" and Central Document No. 1, were the primary impetus for establishing programs that enhanced farming qualifications. According to Zhong & Ferrand (2022), the Government's policy framework expressly declares technical training and entrepreneurship development essential to agricultural modernization. The policy frameworks establish standardized training systems that provide funding and superior resources to training institutions and local governments to attain national rural revitalization and agricultural modernization targets. The alignment with national goals is critical since it sets a focused path for consistently executing training programs between all regions.

The basic infrastructure provided by Government policies is a necessary foundation for farmer training, yet practical limitations within local areas commonly restrict their effectiveness. Secondary data analysis revealed significant policy implementation challenges because of constrained resources, limited infrastructure, and weak local Government capacities. A document from the Guangxi report shows that "Government policies displayed clear design yet their local execution struggled due to insufficiently trained staff and budget scarcity within local administrative structures" (Rust et al., 2022). Further, it highlighted that effective policy implementation relies on governments possessing relevant resources and abilities to carry out stated measures. The successful application of national strategic policies requires appropriate modifications by regional institutions together with the execution capabilities of their local institutions (Zhao et al., 2019). Government policies that correspond to local needs are recognized as essential for successful farmer training programs, with the adaptation of central guidelines for individual regions to address farming conditions and farmer-specific obstacles.

The "One Main Multiple Partners" program in Heilongjiang province used flexible arrangements by connecting farm radio-television schools with agricultural colleges and local institutions for efficient training delivery. It is demonstrated that successful policy implementation achieves better results through localized approaches. China's agricultural policies will succeed by delivering solutions for varying regional conditions while actively including local stakeholders in planning and operational steps; according to Liu et al., (2022), professional farmer capacity enhancement and transformation of traditional farming practices prove more successful when governments form policies that integrate targeted local agricultural priorities.

4.3 Challenges Faced by Farmers

Results from data analysis showed that professional training programs encounter central access and participation barriers which farmers must navigate. The survey revealed that people participating in training programs face difficulties due to limited perceived value and the lengthy time needed for these training sessions. Studies in Heilongjiang province show farmers believe training programs waste valuable time and deliver no immediate financial rewards, thus keeping participants from joining. Prior research confirms that farmers fear training commitment due to their assessment of time requirements related to training program expenses. Farmer behavior indicates they choose immediate revenue generation rather than sustained educational development because they struggle to understand how training leads to profitability (Alias et al., 2021). A hesitancy to participate calls for Government policies that establish direct relationships between training benefits and immediate rewards, which farmers can perceive.

According to one Government report, rural and remote areas where farmers operate usually experience challenges because they lack enough training resources. Training resources such as qualified instructors and relevant materials frequently experience shortages, creating subpar training results (Meng et al., 2024). The reduced availability of training resources diminishes program efficiency because farmers cannot learn the comprehensive knowledge and skills needed to adopt contemporary agricultural practices. According to Zhelyazkova et al., (2024), resource scarcity is demonstrated by the fact that training programs demand competent instructors and durable infrastructure and educational materials. Quality training remains unevenly accessible across different regions as many local governments and institutions fail to meet training programs' needs adequately. Resource shortages create a fundamental impediment that hinders the achievement of farmer training policies. It shows similar patterns where farmers' adoption preferences depend on cultural beliefs about change and their degree of trust in new agricultural techniques (Zhao, 2022). The existing barrier shows the necessity for offering specialized training that understands farmers' individual needs while incorporating their farming practices and modernization preferences. The underlying concerns must be resolved, and a supportive educational space must be created to improve farmers' involvement and adoption of contemporary farming practices.

4.4 Effectiveness of Training

Training programs designed for new professional farmers became a central finding during analysis because they demonstrated successful elements and notable gaps in training skill enhancement capabilities. Participation in training programs led farmers to improve their technical abilities, but these programs appeared weak in influencing their entrepreneurial abilities. A Heilongjiang Government report states that farmers have developed better knowledge of advanced farming methods yet catch errors in implementing entrepreneurial projects and modern business frameworks.

The study also reveals unachieved expected results among programs targeting agricultural training. Participating farmers obtained enhanced technical competencies, but the training did not effectively develop their essential entrepreneurial capabilities to leverage their new skills and documented that how Chinese agricultural training programs lack sustainable entrepreneurial abilities by emphasizing technical expertise instead. The study found considerable differences in how farmers apply training knowledge across different regions because some farmers experienced difficulties managing their acquired knowledge because of resource limitations and inadequate infrastructure. Meng et al., (2024) showed that farmers in distant regions encountered significant obstacles to adopting contemporary farming practices because they lacked essential tools and equipment together with market access. Farmers need more than just knowledge-based training since program support systems must exist to help them translate their learned knowledge into practical usage, and the practical training needs supplementary programs that develop infrastructure, market access, and necessary tool distribution to yield successful knowledge applications in agricultural systems.

Different levels of training effectiveness emerged from weak consistency in the quality of instruction at various locations. Rust et al., (2022) reported that training quality exhibited significant diversification based on the professional competence of local institutions and expertise shortages throughout different regions in Guangxi. The inconsistent training quality reveals an implementation flaw because regional resource disparities generate uneven farmer education opportunities. Further emphasized that superior training techniques are essential for effective agricultural programs. Agricultural training programs succeed based on how well trainers match their qualifications with farmer needs.

4.5 Stakeholder Collaboration

Analysis revealed stakeholder collaboration as the essential theme, confirming that effective implementation of farmer training programs depends on the coordinated actions between institutions, training providers, local communities, Government agencies and agricultural institutions. The results demonstrated that training delivery depends on cooperation networks that provide accessible educational support. Local agricultural schools, in partnership with Government agencies and community organizations, effectively organized their resources to extend training reach according to Heilongjiang data (Chen, 2025). Results support other scholarly works emphasizing multi-stakeholder partnerships' critical role in policy execution procedures. The study of Bist et al., (2024) demonstrated that policy networks reach optimal results through multi-stakeholder cooperation that enables expertise and resource sharing for unified goal attainment. Local agricultural schools joined forces with Government agencies to create training programs that suit both the national objectives and the distinctive agricultural requirements of the local area.

The data showed that training programs achieved success through stakeholder cooperation in specific regions yet exposed major hurdles in areas where stakeholder relationships were disconnected or fragmented. Local news reports from Guangxi province showed that when training providers and local governments failed to collaborate effectively, farmers received reduced support and fewer training possibilities (Akintuyi, 2024). Participants from regions without coordination between stakeholders encountered obstacles preventing them from obtaining the necessary resources to implement new training knowledge. Qin et al., (2022) validated the prevalence of fragmented collaboration, demonstrating that policy networks perform better when stakeholders maintain strong working relationships.

The quality of stakeholder interactions influences policy implementation because weak or improperly managed relationships result in resource inefficiency and missed opportunities to enhance outcomes. A report from local agricultural chambers emphasizes that private-sector collaboration provides farmers with modern agricultural technologies while extending market information beyond what training programs teach (Chen, 2025). Farmers obtain practical practice-based knowledge about agriculture through collaboration, while training programs connect academic theory to marketplace agricultural methods; in this regard, Liu et al., (2023) illustrated how industries create agricultural policies through partnership with private stakeholders whose proficiency and funding help connect theory to practice, while Zhao (2022) stated the inclusion of private sector actors in this situation has become a valuable resource that improves training results and empowers farmers with more substantial capabilities to achieve success in their competitive market.

4.5 Discussion

The study sheds light on the role of Government policies, stakeholder collaboration, and the barriers encountered during training program implementation. It revealed important insights into the challenges and successes of cultivating new professional farmers in East China. Government support and policy frameworks have proven to be critical drivers in shaping the overall direction of farmer training initiatives. In this way, the 13th Five-Year Plan for the Cultivation and Development of New Professional Farmers can provide a clear framework for agricultural modernization and rural revitalization. The effectiveness of these policies is contingent not only on their design but also on the capacity of local governments to implement them effectively. While national policies offer strategic guidance, their success depends mainly on how well these policies are adapted and executed at the local level; addresses the importance of local adaptation, with scholars like Zhong and Ferrand (2022) noting that the ability to tailor national policies to local contexts is a critical factor for success, which is often hindered by resource constraints and insufficient infrastructure, leading to uneven outcomes across regions.

The study demonstrated that stakeholder alliances are essential for achieving policy success, along with effective teamwork between Government agencies, agricultural institutions, and local communities, which leads to better training programs that remain accessible to farmers. Efficient partnerships between entities enhance resource-sharing capabilities and know-how sharing with additional benefits in training support mobilization. Regions marked by weak stakeholder collaboration faced major implementation problems that resulted in incomplete program delivery and restricted access to training options. Rust et al., (2022) proposed that policy networks are essential in public policy outcomes. A coordinated system emerges when Government institutions join forces with educational institutions, the private sector, and civil society organizations to support policy implementation effectively. When agricultural training programs had fractured partnerships or inadequate oversight between stakeholders, farmers found it difficult to capitalize on the benefits of learning opportunities, resulting in a diminished impact of the initiative.

Despite extensive Government and stakeholder initiatives, multiple obstacles prevent the maximum achievement of training program effectiveness. The main barrier preventing farmers' active participation in these programs originates from their weak motivation toward them. Numerous farmers view training programs as lengthy commitments which fail to yield immediate practical advantages given the deep traditional character of farming methods throughout their lands.

The unwillingness of farmers to experiment with new methodology matches, indicating farmers adopt new practices with apprehension due to cultural traditions and assessment of dangers (Alias et al., 2021). Training programs must overcome this difficulty through structured demonstrations showing practical outcomes that answer farmers' fundamental questions about improved yield production while offering higher economic rewards and expanded market opportunities. The success of training programs requires focused tactics combining technical expertise with entrepreneurship training and creative problem-solving skills development. In many regions, insufficient training materials, lack of qualified instructors, and inadequate infrastructure remain pervasive resource allocation challenges. They conclude that better financial support must accompany strategic resource planning efforts at local institutions, and the effectiveness of training programs in numerous regions depends on sufficient resources. In contrast, local educational institutions conduct hands-on training sessions successfully.

4.6 Barriers to Successful Implementation

The analysis found deficient resources across rural and remote regions are the central obstruction to successfully implementing new professional farmer training programs. Governments in Guangxi face delivery challenges due to insufficient financial support and inadequate site personnel, which prevents them from deploying essential training facilities. According to a report from Guangxi (Li, 2023), the training programs face substantial quality obstacles because of resource constraints, trainer shortages, and restricted equipment access. Zhang et al., (2024) state that substantial infrastructure and human capital investments are essential for successful agricultural policy implementation, which typically remains absent in underdeveloped areas. Limited and inadequate resources create dual challenges which degrade training standards while restricting equal access to educational opportunities in marginalized farming areas. New agricultural training initiatives encountered difficulties because most farmers resisted shifting from their existing practices. Most farmers applied doubt to official farming training programs because they hesitated to change their present farming conduct. Farmers in Heilongjiang demonstrate reluctance toward new practices because they consider modern agricultural techniques complicated and incompatible with their traditional ways (Javaid et al., 2022). The literature shows that cultural background and strong historical dependence on conventional farming have proven to be substantial impediments to adopting innovation. Addressing this challenge requires purposeful training, community participation, education, and a phased introduction of new farming practices that match established cultivation techniques.

4.7 Policy Implication

The imbalance of resources requires immediate policy intervention, especially in underdeveloped remote locations. The accomplishment of training programs remains limited by outdated infrastructure, instructor shortages, and access to current agricultural tools. Leadership at all levels must dedicate funding to remote regions so local administrators can get training materials and qualified staff to execute premium curricula. Training programs require integrated coordination between governmental departments, agricultural institutions, and local communities to develop region-specific programs for optimal results. Empowered policy networks can accelerate collaboration between Government sectors by increasing shared resources. Nation-wide policy success requires local agricultural institutions to develop capacity which serves federal goals and rural transformation initiatives.

The policy requires farmer-centered training programs that put the professionals at the forefront. The survey data established that farmers resist training opportunities because they see no immediate rewards and stick to conservative agricultural methods. Training programs should present immediate advantages to farmers through raised productivity and income levels while offering further backing for using new techniques in their farming operations. It should focus its curriculum on the particular needs of farmers while offering instruction in entrepreneurial abilities, market entry approaches, and hands-on applications for new technologies. When policymakers base training programs on specific farmer needs and aspirations, these measures will drive higher participation levels alongside more substantial program commitment, which leads to broad-scale adoption of modern agricultural methods.

5. CONCLUSION & RECOMMENDATIONS

The study reveals important details about East China's new professional farming development by examining the lasting contributions of Government support and stakeholder contributions and the obstacles training programs face. The established policies have brought substantial progress toward farmer technical skill improvement and agricultural modernization, but research reveals essential limitations that challenge program effectiveness. The widespread adoption of new agricultural practices faces obstacles from multiple directions, including limited financial resources, inconsistent training quality across regions, and farmers stubbornly opposing the implementation of new methods. The research reveals that effective agricultural development demands additional specific initiatives tailored to local contexts, better coordination between stakeholders, and increased assistance for farmers to fight financial limitations and motivational hurdles.

Agricultural modernization and rural revitalization require policies prioritizing closing gaps through effective resource management, improved training methods, and swift application of new agricultural practices. Manual enterprise success requires joint participation from governments, agricultural institutions, private sector actors, and local community members to create educational and training conditions for farmers. Developing professional farmers through local-specific policies and practical skills-based training programs will become essential in sustainable agricultural growth and rural community revitalization in China.

6. LIMITATIONS AND FUTURE RESEARCH

This study delivers significant findings about developing new professional agricultural producers but faces several constraints. The use of secondary data successfully obtained broad policy frameworks yet limited researchers' potential to understand specific farmer experiences and emotional responses. Primary data collection techniques through interviews and surveys targeting farmers and local officials and trainers would produce enhanced knowledge about the implementation outcomes of farm policies. The study focused on an East China case and therefore limits its universality when applied to agricultural conditions and policy dimensions that differ from the ones studied. Future research should introduce expanded analysis between distinct geographical areas of China and worldwide comparisons for assessing training program results in multiple regions. The study will also examine how training interventions influence farmers' livelihoods and rural economic sustainability and provide valuable insights into policy longevity in rural communities.

REFERENCES

Akintuyi, O. B. (2024). Adaptive AI in precision agriculture: a review: investigating the use of self-learning algorithms in optimizing farm operations based on real-time data. *Research Journal of Multidisciplinary Studies*, *7*(02), 016-030. https://doi.org/10.53022/oarjms.2024.7.2.0023

Alias, N., Awang, Z., Muda, H., & Mazlan, N. H. (2021). Supporting the Policy Implementation Performance of Public Primary School Leaders in Malaysia: A Confirmatory Factor Analysis (CFA) of Public Leadership. *The Journal of Management Theory and Practice (JMTP)*, 1-7. https://doi.org/10.37231/jmtp.0..0.130

Bist, R. B., Bist, K., Poudel, S., Subedi, D., Yang, X., Paneru, B., ... & Chai, L. (2024). Sustainable poultry farming practices: A critical review of current strategies and future prospects. *Poultry Science*, 104295. https://doi.org/10.1016/j.psj.2024.104295

Chen, Z. (2025). Implementation Pathways for Vocational Education in Supporting the Cultivation of High-Quality Farmers. *Journal of Theory and Practice in Education and Innovation*, *2*(1), 15-21.

Du, S., Liu, J., & Fu, Z. (2021). The impact of village rules and formal environmental regulations on farmers' cleaner production behavior: New evidence from China. *International Journal of Environmental Research and Public Health*, *18*(14), 7311. https://doi.org/10.3390/ijerph18147311

Guo, Z., Chen, X., & Zhang, Y. (2022). Impact of environmental regulation perception on farmers' agricultural green production technology adoption: a new perspective of social capital. *Technology in Society*, *71*, 102085. https://doi.org/10.1016/j.techsoc.2022.102085

Javaid, M., Haleem, A., Singh, R. P., & Suman, R. (2022). Enhancing smart farming through the applications of Agriculture 4.0 technologies. *International Journal of Intelligent Networks*, *3*, 150-164. https://doi.org/10.1016/j.ijin.2022.09.004

Karunathilake, E. M. B. M., Le, A. T., Heo, S., Chung, Y. S., & Mansoor, S. (2023). The path to smart farming: Innovations and opportunities in precision agriculture. *Agriculture*, *13*(8), 1593. https://doi.org/10.3390/agriculture13081593

Liao, W., Zeng, F., & Chanieabate, M. (2022). Mechanization of small-scale agriculture in China: Lessons for enhancing smallholder access to agricultural machinery. *Sustainability*, *14*(13), 7964. https://doi.org/10.3390/su14137964

Liu, H., Zhu, Q., Khoso, W. M., & Khoso, A. K. (2023). Spatial pattern and the development of green finance trends in China. *Renewable Energy*, *211*, 370-378. https://doi.org/10.1016/j.renene.2023.05.014

Liu, J., Li, X., Liu, S., Rahman, S., & Sriboonchitta, S. (2022). Addressing rural–urban income gap in China through farmers' education and agricultural productivity growth via mediation and interaction effects. *Agriculture*, *12*(11), 1920. https://doi.org/10.3390/agriculture12111920

Lu, X., Zhang, Y., & Zou, Y. (2021). Evaluation the effect of cultivated land protection policies based on the cloud model: A case study of Xingning, China. *Ecological Indicators*, *131*, 108247. https://doi.org/10.1016/j.ecolind.2021.108247

Maas, B., Fabian, Y., Kross, S. M., & Richter, A. (2021). Divergent farmer and scientist perceptions of agricultural biodiversity, ecosystem services and decision-making. *Biological Conservation*, *256*, 109065. https://doi.org/10.1016/j.biocon.2021.109065

Meng, X., Yang, S., & Pan, G. (2024). Innovation practices in agricultural transformation in East China: Exploring the impact and implications of the new professional farmer training model. *Heliyon*, *10*(14).

Mizik, T. (2023). How can precision farming work on a small scale? A systematic literature review. *Precision agriculture*, *24*(1), 384-406. https://doi.org/10.1007/s11119-022-09934-y

Papamichail, G., Rosiello, A., & Wield, D. (2023). Addressing public policy implementation challenges in lagging regions through the analytical lens of smart specialisation. *Journal of the Knowledge Economy*, *14*(1), 356-381. https://doi.org/10.1007/s13132-021-00874-y

Qin, T., Wang, L., Zhou, Y., Guo, L., Jiang, G., & Zhang, L. (2022). Digital technology-and-services-driven sustainable transformation of agriculture: Cases of China and the EU. *Agriculture*, *12*(2), 297. https://doi.org/10.3390/agriculture12020297

Rhodes, R. A., & Marsh, D. (1992). New directions in the study of policy networks. *European journal of political research*, *21*(1-2), 181-205. https://doi.org/10.1111/j.1475-6765.1992.tb00294.x

Rust, N. A., Stankovics, P., Jarvis, R. M., Morris-Trainor, Z., de Vries, J. R., Ingram, J., ... & Reed, M. S. (2022). Have farmers had enough of experts?. *Environmental management*, 1-14. https://doi.org/10.1007/s00267-021-01546-y

Sharma, V., Tripathi, A. K., & Mittal, H. (2022). Technological revolutions in smart farming: Current trends, challenges & future directions. *Computers and Electronics in Agriculture*, *201*, 107217. https://doi.org/10.1016/j.compag.2022.107217

Sharma, V., Tripathi, A. K., & Mittal, H. (2022). Technological revolutions in smart farming: Current trends, challenges & future directions. *Computers and Electronics in Agriculture*, *201*, 107217. https://doi.org/10.1016/j.compag.2022.107217.

Yin, L. (2020). Research on the cultivation of new professional farmers in Heilongjiang based on the strategy of rural revitalization. *Journal of Contemporary Educational Research*, *4*(5). https://doi.org/10.26689/jcer.v4i5.1254

Zhang, Z., Yu, J., & Tian, J. (2024). Community participation, social capital cultivation and sustainable community renewal: A case study from Xi'an's southern suburbs, China. *Journal of the Knowledge Economy*, *15*(3),11007-11040. https://doi.org/10.1007/s13132-023-01536-x

Zhao, D., Chen, Y., Parolin, B., & Fan, X. (2019). New Professional Farmers' Training (NPFT): A multivariate analysis of farmers' participation in lifelong learning in Shaanxi, China. *International Review of Education*, *65*, 579-604. https://doi.org/10.1007/s11159-019-09790-5

Zhao, J. (2022). The policy effect of deliberative implementation: An explanation based on the policy discretion-feedback model. *Journal of Management World*, *38*(04), 95-108.

Zhelyazkova, A., Thomann, E., Ruffing, E., & Princen, S. (2024). Differentiated policy implementation in the European Union. *West european politics*, *47*(3), 439-465. https://doi.org/10.1080/01402382.2023.2257963

Zhong, X., & Ferrand, C. (2022). [Retracted] Construction of Agricultural Products of e-Commerce Ecological Network System under the Background of "Internet Plus". *Wireless Communications and Mobile Computing*, *2022*(1), 8121193. https://doi.org/10.1155/2022/8121193.

Examining the Influence of Digital Leadership, Organizational Culture and Strategic Approaches to Digitalization

Haipeng Wu[1] and Phanthida Laophuangsak[2*]

[1-2]Faculty of Educational Administration Southeast Asia University, Bangkok,10700, Thailand

Article Information	ABSTRACT
  Corresponding Author: Phanthida Laophuangsak Panthida_c@yahoo.com https://orcid.org/0009-0001-9593-5508	The study aims to identify the key factors driving successful digital transformation through digital leadership and organizational culture. A quantitative study utilized multiple regression analysis to test the hypothesized relationships among digital leadership, organizational culture design thinking and knowledge sharing. Data was collected from 400 managerial-level employees in technologically advanced organizations in Beijing, China. The findings reveal that all four independent variables, digital leadership, organizational culture, design thinking, and knowledge sharing, positively and significantly influence digitalization, with organizational culture and design thinking having the most potent effects. These results emphasize the importance of leadership, culture, innovation and knowledge management in driving digital transformation. The study concludes that organizations should foster strong digital leadership, a supportive culture and innovative approaches to enhance their digital capabilities. Its practical implications highlight the importance of investing in these factors to navigate digital transformation successfully in today's business environment. **Keywords:** Digitalization; Digital Leadership; Organizational Culture; Design Thinking, Knowledge Sharing

1. INTRODUCTION

Global enterprises are undergoing transformative operational shifts because of the increasing integration of digital technology in their operations (Cameron et al., 2006). Modern business's advanced digital transformation faces two critical tasks of technological progress combined with environmental sustainability preservation (Westerman et al., 2014). Green transformation has become important for sustainability and environmental stewardship throughout the digital world (Liu et al., 2023). The transformation calls for leaders to actively deal with adverse environmental effects, protect natural resources, and promote enduring business practices. The essential development for future organisations depends on digitalization, meeting sustainability needs (Wang et al., 2022). Digital leadership, organizational culture, and strategic approaches in digitalisation play pivotal roles in this transformation. Digital leadership entails leading organisations through technology adoption by maintaining employee intellectual involvement in building future-oriented digital plans that support sustainable development objectives (Iqbal & Piwowar-Sulej, 2023).

Digital modernisation needs fundamental technological changes with corporate principles and working frameworks. The leadership team must establish and develop strategic goals that unite digital

innovation and green transformation (Westerman et al., 2014). AlNuaimi et al. (2022) investigated the interrelations between leadership, cultural aspects, and strategic approaches to enable such transformations. However, integrating strategic leadership has increased interest in sustainable digital success. The core mechanism of this transformation depends on organisational culture since it affects both acceptance rates and execution methods of digitalisation projects. Organisations with adaptable cultures, an experimental mindset, and technological vision experience improved success with digital transformation efforts (Cameron et al., 2006). A culture resisting change will obstruct progress, so leaders must develop strategies to modify organisational cultures that allow digital evolution and innovation (Leal-Rodríguez et al., 2023). Designers may enable organisations to create digital solutions that match user requirements through their strategic approach, promoting customer-focused innovation and creative problem-solving. Shin et al. (2023) proposed that organisations can establish improved digital approaches that achieve broad acceptance due to designers' strategic framework while stimulating internal learning.

Companies struggle to successfully integrate leadership with culture and knowledge management systems, which results in low returns on investment in digital technology. In this way, organisations lose opportunities because they focus on technology rather than establishing the organisational resources and implementation skills necessary for successful adoption (Mollah et al., 2023). The complexity of digital leadership relationships with organisational culture creates confusion while building strategic approaches to digital transformation (Asif et al., 2024). Knowledge sharing blocks organisational progress because cultural and technical barriers impede the ability of organisations to maximise the potential of their digital investment (Fang, 2023). This paper aims to investigate the issues by exploring the interaction between digital leadership, organisational culture, design thinking, and knowledge sharing to obtain successful digital transformations through an integrated framework that enhances leadership and organisational culture while fostering effective knowledge-sharing and innovation. It also provides a roadmap for organisations to cover the complexities of digital transformation and maximise the benefits of digital technologies.

2. LITERATURE REVIEW

2.1 Digital Leadership and Digitalization

Digital leadership is a significant facilitator for shifting organisations and adopting the principles of the digital age. Also, digital leadership is about the stewardship of organisations when implementing digital transformation, which entails the coordination of managing digital technologies that can improve different business activities, goods, and services (de Araujo et al., 2021). According to Hensellek (2020), digital leadership is the capability of leaders to support and lead the change management of digital processes in an organisation. It comprises a spectrum of skills and knowledge from vision formulation to comprehensive strategic perspective with general managerial skills and the capacity to foster and implement changes within the organisation's culture. Leadership is also identified as a critical factor in digital transformation management as the leaders with high scores in these aspects will better initiate, manage and provide support to the digitalisation processes because these leaders can integrate technology into business strategies better and promote innovation (Kıyak & Bozkurt, 2020). Digital leadership also impacts organisational culture, as culture is another essential factor affecting an organisation's digitalisation level (Westerman et al., 2014).

With digital leadership, technology is emphasised to transform business processes and practices and thus change the organisational culture and dynamics by encouraging workers to accept an organisation's

new technology and change (Cahyadi & Magda, 2021). This cultural perspective is significant for digitalisation because it facilitates the ability to change culture and adopt new strategies effectively in response to market and technological changes. In addition, several companies have digital leaders at the helm who ensure that inventive projects become teamwork to enable the creation of digital solutions (Abbu et al., 2020).

H1: Digital Leadership positively influences digitalisation.

2.2 Organisational Culture and Digitalisation

Leso et al. (2023) proposed that organisational culture is the main driving factor that impacts digitalisation in organisations since digitalisation is becoming more significant to company success and identifies organisational culture patterns. Leal-Rodríguez et al. (2023) argue that organisational culture is the summation of the norms and practices that the employees of an organisation hold that guide their behaviour within a specific context. This study reviewed the existing literature on the context of organisational culture and outcomes of digitalisation while arguing about how culture can support or frustrate digitalisation processes.

Leso et al. (2023) specifically contended that assertiveness with positive values emphasises the necessity of a robust organisational culture and work environment to promote digitalisation, as corporate cultural attributes like taking risks, experimenting, and learning from mistakes improve the execution of the digital business strategy. Leadership is central to developing the organisational culture and cannot be overemphasised. Thus, Schein (2010) argued that change in organisational culture regarding digitalisation could be fostered through leadership that embraces and drives the culture through their behaviour.

H2: Organisational Culture positively influences digitalisation.

2.3 Design Thinking and Digitalization

Digitalization has emerged as one of the most critical focus areas in design thinking. Design thinking is an innovation process that involves considering the customers, technology use, and companies' economic benefits (Vendraminelli et al., 2023). This study aims to understand how and in what ways the concepts of design thinking and digitalisation are intertwined and how design thinking principles can shape the digitalisation process. Thus, Kamble et al. (2023) argued that design thinkers create an innovative culture, contributing to organisations' digitalisation. It fosters understanding of product users by seeking to put themselves in their shoes while making the process highly iterative to achieve positive outcomes through experimentation. Thus, more attention to the needs and expectations of the user as a key factor of the digital transformation process will result in the higher adoption of the initiatives and better execution of digital projects (Bustard et al., 2023).

Design thinking is also widely utilised to improve an organisation's level of cooperation, which is considered a critical element for implementing digitalisation. Such an approach uses cross-functional teams to avoid compartmentalisation and improve the coherence of the digital efforts undertaken at a company or an organisation (Mortati et al., 2023). In design thinking, the firm can better integrate digital business initiatives into organisation-wide strategic objectives to coordinate and orient the firm's digitisation efforts.

H3: Design Thinking positively influences digitalisation.

2.4 Knowledge Sharing and Digitalization

It is well understood that knowledge sharing is among the most important factors that positively impact organisational digitalisation (Cahyadi & Magda, 2021). Knowledge sharing occurs when individuals and teams willingly and freely transfer and share knowledge (Deng et al., 2023). They examine the link between knowledge-sharing and digitalisation and how sound knowledge-sharing practices may support the digital transformation agenda. Thus, knowledge sharing impacts digitalisation in disseminating crucial information and efficient practices within the company.

In addition, the flow of explicit knowledge empowers the idea of learning and change processes that digital business organisations require, especially when shifting towards the digital business model. Today's markets and technologies are characterised by continuous development; thus, an organisation must learn to embrace change and effectively manage new situations and opportunities (Eslami et al., 2023). They stipulate that knowledge sharing allows an organisation to adapt to the modern digital environment to ensure that every worker is informed with the necessary knowledge to address emerging trends and issues (Liu et al., 2023). The constant flow of information between these functions is a great way to strengthen the organisation's foundations and address the challenges of digitalisation more effectively.

H4: Knowledge sharing is positively influenced by Digitalization

2.5 Theoretical Background

The study combines three main theoretical frameworks to explicate relationships between the core theoretical constructs in the proposed research model: digital leadership, organisational culture, design thinking, knowledge sharing and digitalisation. A more comprehensive and targeted investigation of the factors that affect the success of digital transformation in businesses is made possible by this method of combining various elements into theoretical frameworks that are less coherent. These frameworks lay the necessary theoretical basis for understanding the dynamic relationship between the constructs and a shared vision of the combined effect of these other factors in achieving organisational success in the digital age.

2.5.1 Transformational Leadership and Organizational Culture

Shaping an organisation's efforts in digital transformation is essential for digital leadership and the digital organisational culture. Thus, Westerman et al. (2014) proposed that digital leadership helps direct and drive organisational technological adoption and digital initiatives. Thus, (Liu et al., 2023) espoused that good leaders inspire and motivate employees by engaging in change, innovation and technologically advanced environments. Such digital leadership is not just about managing technological changes; it also entails creating an environment of innovation and change in the organisation. Accordingly, Schein (2010) proposed that employees' acceptance and execution of digital efforts depend heavily on their shared values, attitudes, and behaviours. Successful digital solution integration requires a culture that supports experimentation, adaptability, and new technology, including humans. The key pillars of digital transformation are organisational culture and transformational leadership, which align the vision and cultural preparedness and, eventually, the organisation's capacity to utilise and implement technological advancements successfully.

2.5.2 Innovation and Knowledge Management

Nonaka et al. (1996) explained that innovation and knowledge management theory is how organisations create and share knowledge to innovate. It aligns with design thinking, a human-centric

126

approach to problem-solving by calling for empathy and ideation and then prototyping to solve problems and drive innovation. Organisations can ease the adoption and integration of digital solutions by integrating technology initiatives with consumer needs through design thinking in digital transformation (Hoe, 2006). In order to foster innovation and improve decision-making, knowledge management enshrines the knowledge-sharing approach of sharing data and insights across organisational boundaries (Nezafati et al., 2009). In the digital transition, understanding a culture of information sharing is essential for removing organisational silos and fostering employee collaboration, particularly in complicated scenarios. In order to achieve digital success, the combination of design thinking and information sharing ensures that digital strategies are not only creative but also user-centric and based on organisational knowledge.

2.5.3 Technology-Organisation-Environment (TOE) Framework

Technological-Organisation-Environment (TOE) provides a practical framework for understanding digitalisation since it deals with multifaceted processes (Baker, 2011). Such a framework demonstrates how technology features, organisational design, and external pressures affect digital technologies implemented in organisations. Digitalisation represents using digital technology to transform business processes, organisational structures, and value propositions. The TOE framework demonstrates how digitalisation efforts rely on successfully integrating technology with organisational features and external environmental forces, including leadership and cultural aspects, market requirements, and regulatory needs. Through its TOE framework, organisations receive complete knowledge about the difficulties and potential gains they experience when implementing new technologies (Oliveira & Martins, 2010). Organisations that analyse their technological readiness, organisational capabilities, and environmental factors gain better control of digitalisation complexities. The TOE framework is completed when it incorporates digital leadership alongside organisational culture design thinking and knowledge sharing to strategically allow organisations to manage their digitalisation process for sustainable success, as illustrated in Figure 1.
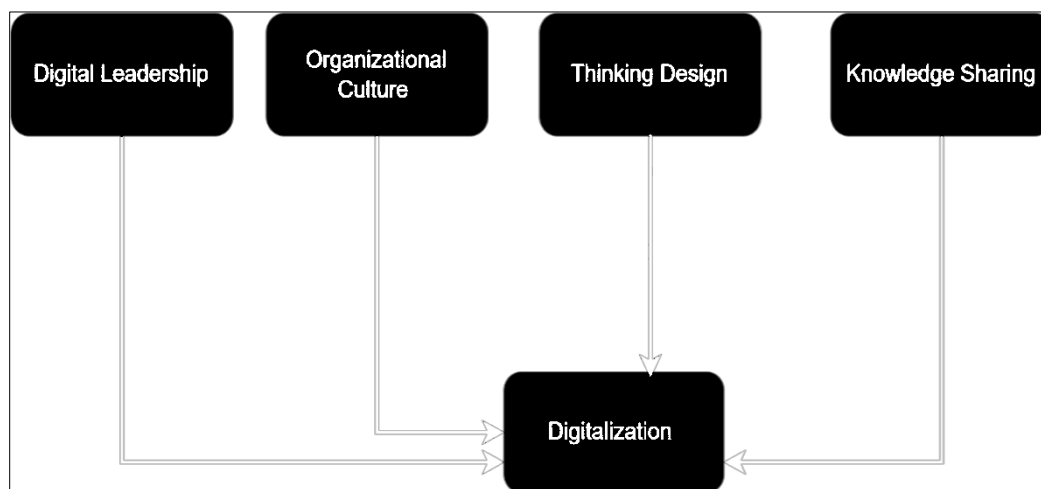

Figure 1: Research Model

3. METHODOLOGY

This study employs a quantitative research design for exploring the influence of digital leadership and design thinking on organisational culture.

The study's goal is to quantify the correlations between these factors and evaluate their influence within the organisational environment, and this design is likely appropriate for that purpose. The study facilitates the collection and analysis of numerical data. Its statistical inference through a quantitative approach is particularly valuable for empirically validating hypothesised relationships. It offers a robust framework to understand the contribution of digital leadership and design thinking to enhance organisational outcomes. The statistical analysis of the study aims to provide actionable insights into the role of these factors in promoting organisational effectiveness in the face of digital transformation.

3.1 Sample Size and Sampling Technique

The study collected data from 400 participants of managerial-level employees across various organisations in Beijing to ensure sufficient statistical power to detect significant effects and interactions among the key variables. It is a city renowned for its technological advancement and high concentration of businesses undergoing digital transformation initiatives. The sample size exceeds the minimum requirement for strengthening the reliability and generalizability of the findings; due to the city's prominence in innovation and business development, it is an ideal context for this research. The study adopted a stratified random sampling technique to ensure a representative sample, enabling the capture of diverse perspectives from different regional sectors and business environments.

3.2 Data Collection

Data collection for the study was carried out through structured surveys distributed to selected participants in Beijing. We designed the survey to assess key constructs like design thinking, digital leadership, knowledge sharing, organisational culture, and the degree of digitalisation within various organisations. We utilised the design thinking scale from Vignoli et al. (2023) to capture innovative and organisational problem-solving abilities. The study employed a scale developed by Büyükbeşe et al. (2022) for digital leadership. It helps evaluate leaders' proficiency in digital skills, attitudes toward digital technologies, and behaviours promoting a digital-first culture. To measure knowledge sharing, we used a scale adapted from Yi (2009) that looks at employee knowledge exchange frequency, quality, and efficiency. The organisational culture is measured using Van Muijen's (1999) scale, which examines the prevailing attitudes, values, and practices that influence organisational operations and responses to digital challenges. Lastly, we measured the extent of digitalisation using a scale from Garg et al. (2024), focusing on how well digital technologies are integrated and utilised.

3.3 Analysis Techniques

The study utilised two advanced statistical analysis techniques, SPSS (Statistical Package for the Social Sciences) and multiple regression analysis, to handle the complex data sets and rigorously test the variables' relationships. SPSS was chosen for its robust capabilities in managing large datasets and performing various statistical tests that are crucial for the initial stages of our analysis. It included descriptive statistics, which enabled an understanding of the data descriptions and gave initial impressions and trends, while inferential statistics were carried out to determine relationships.

3.4 Ethical Considerations

The study strictly adhered to ethical principles for ensuring the protection and respect of all participants. Participants were given comprehensive information about the study's goals, methods, data use, rights, and the freedom to discontinue participation without repercussions.

Participants' confidentiality and anonymity were preserved by anonymising survey replies and safely preserving demographic data, which will be erased at the end of the study. The study only addressed professional inquiries about organisational innovation and digital leadership without interfering with participants' personal lives. The participants' dignity and rights were fully respected throughout the study, with additional precautions taken to prevent harm.

4. RESULTS AND DISCUSSION

4.1 Demographic Information

Table 1 shows a diverse representation of 400 participants, with male participants accounting for 60% of the total while female participants comprise 40%. Most employees who completed the survey belonged to the younger and middle-aged segments, where the most significant demographic segment consisted of workers who were 36 to 45 years old. The majority of participants in this study completed university studies at the master's level, and before them, there were participants with undergraduate degrees at 37.5%. A sample composed mainly of professionals with six to ten years of work experience exists according to the results (35%). The data shows that technology-driven industries comprise a significant portion of the company as both Information Technology (25%) and Manufacturing (22.5%) represent most of the organisations in this participant sample. Senior-level and executive-level managers form 37.5% of the study subjects, while the rest (50%) fill entries in middle management categories.

Table 1: Demographic Information of Participants

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	240	60.0
	Female	160	40.0
Age Group	18-25 years	50	12.50
	26-35 years	120	30.0
	36-45 years	140	35.0
	46-55 years	70	17.5
	56 years and above	20	5.0
Education Level	High School	10	2.50
	Undergraduate Degree	150	37.50
	Master's Degree	180	45.0
	Doctorate	60	15.0
Work Experience	1-5 years	80	20.0
	6-10 years	140	35.0
	11-15 years	120	30.0
	16+ years	60	15.0
Industry Sector	Information Technology	100	25.0
	Manufacturing	90	22.50
	Finance/Banking	80	20.0
	Consulting	50	12.50
	Healthcare	30	7.50
	Other	50	12.50
Managerial Level	Mid-Level	200	50.0
	Senior-Level	150	37.50

Executive-Level	50	12.50

4.2 Socioeconomic Features

Table 2 shows the socioeconomic features of key variables involved in the study, providing insight into their central tendencies, variability, and distribution characteristics. The mean values indicate that participants generally rated Digital Leadership (4.15), Organizational Culture (3.95), Design Thinking (4.05), knowledge Sharing (3.85), and Digitalization (4.1) positively, with scores above 3.5, suggesting a generally favourable perception of these factors. The standard deviation values, ranging from 0.58 to 0.68, show moderate variability in participants' responses, indicating some diversity in opinions but relatively consistent views overall. The skewness values are all negative, suggesting that the distributions of responses are slightly skewed to the right, indicating a tendency towards higher scores (positive perceptions) for all variables. The kurtosis values are close to zero, indicating that the distributions are relatively normal, with no significant outliers or heavy tails.

Table 2: Socioeconomic Features of Key Variables

Variable	Mean	Median	Standard Deviation	Skewness	Kurtosis
Digital Leadership	4.15	4.2	0.68	-0.25	-0.1
Organisational Culture	3.95	4	0.6	-0.2	0
Design Thinking	4.05	4.1	0.62	-0.15	-0.05
Knowledge Sharing	3.85	3.9	0.58	-0.1	0.2
Digitalisation	4.1	4.15	0.65	-0.18	0.05

4.3 Correlation Matrix Analysis

Table 3 shows a positive interdependence between the key variables, as the correlation matrix indicates. It established a significant positive relationship between digital leadership and digitalisation, 0. 75, suggesting that efficient digital leadership positively relates to a greater degree of digitalisation. There are moderate positive associations with Organizational Culture, with a correlation coefficient of 0. 7; Design thinking, with a coefficient of 0. 65; and Knowledge sharing, with a coefficient of 0. 6, which indicates a strong positive relationship with digital leadership. The results show that Organizational Culture has a higher correlation with Knowledge Sharing (0. 8); it also has a positive correlation with digitalisation to the extent of 0. 7. This testifies that a positive organisational culture is key to knowledge-sharing and digitalisation. Design Thinking correlates more significantly with digitalisation than Knowledge Sharing, suggesting its importance in enabling innovation and digitisation. Sharing of knowledge has the highest correlation coefficient with digitisation with a score of 0. 85, implying that proper management of knowledge-sharing practices is critical to achieving the organisation's digitisation goals. It indicates the interdependency between digital leadership, organisational culture, design thinking and knowledge sharing regarding digitalisation.

Table 3: Correlation Matrix for Key Variables

	Digital Leadership	Organisational Culture	Design Thinking	Knowledge Sharing	Digitalisation
Digital Leadership	1.00	0.7	0.65	0.6	0.75
Organisational Culture	0.7	1.00	0.6	0.8	0.7
Design Thinking	0.65	0.6	1.00	0.75	0.8
Knowledge Sharing	0.6	0.8	0.75	1.00	0.85
Digitalisation	0.75	0.7	0.8	0.85	1.00

4.4 Multiple Regression Analysis

The statistical method of multiple regression analysis enables researchers to connect a dependent variable with multiple independent variables throughout an analytical assessment. The current research relies on multiple regression analysis to determine the combined effect of Digital Leadership with Organizational Culture, Design Thinking, and knowledge Sharing upon Digitalization within organisations. The study focuses on determining how several variables affect digital transformation processes in technologically advanced organisations because digital change manifests in various ways. The analysis fully understands variable significance by evaluating each component beyond other contributing factors. This study investigates relationships between key system elements to determine which ones positively affect organisations' digitalisation initiatives within technologically advanced organisations. Multiple regression establishes a valid testing system and theoretical model assessment by incorporating the independent variable contribution to digitalisation variance. The results produced through these analyses contribute to digitalisation theory while simultaneously providing actionable help for organisational leaders who want to create digital transformation environments and policymakers seeking organisational growth. The multiple regression analysis results show variable relationships in subsequent tables, contributing statistical evidence to validate the study's findings.

4.4.1 Model Fit Analysis

Table 4 shows the model fit summary, determining the model's reliability and fitting performance. The strong direct relation between digitalisation and independent variables emerges through the R-value of 0.915. Digitalisation has 83.8% of its explanatory power from the variables used in the model, as shown through the R^2 value of 0.838. The adjusted R^2 value of 0.834 excludes predictors while maintaining a high level of model explanation power. The standard error of the estimate at 0.477 indicates the average measurement distance between actual Digitalization values and their predictions, which indicates a moderate prediction accuracy.

Table 4: Model Fit Summary

Model	R	R²	Adjusted R²	Std. Error of the Estimate
1	0.915	0.838	0.834	0.477

4.4.2 ANOVA Analysis

Table 5 shows that the F-statistic of 131.68 is highly significant, with a p-value of 0.000, indicating that the model significantly explains the variance in the dependent variable, digitalisation. The Sum of Squares for Regression (118.59) represents the variability in digitalisation explained by the independent variables (Digital Leadership, Organizational Culture, Design Thinking, and Knowledge Sharing). In contrast, the Residual Sum of Squares (22.67) represents the unexplained variability. The Mean Square for Regression (29.645) is calculated by dividing the sum of squares for regression by the degrees of freedom (df = 4), and the Mean Square for Residual (0.057) is the residual sum divided by the degrees of freedom for the residuals (df = 395). The large F-value, along with the p-value of 0.000, confirms that the independent variables in the model have a statistically significant combined effect on digitalisation, making the regression model a good fit for the data.

Table 5: ANOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	118.59	4	29.645	131.68	0
Residual	22.67	395	0.057		
Total	141.26	399			

4.4.3 Coefficient

Table 6 provides insights into the individual impact of each independent variable on digitalisation. The unstandardised coefficients (B) indicate the raw effect of each predictor, where Digital Leadership has a coefficient of 0.424, meaning that for each one-unit increase in digital leadership, digitalisation increases by 0.424 units, holding other variables constant. Similarly, organisational culture, design thinking, and knowledge sharing have coefficients of 0.361, 0.371, and 0.389, respectively, showing that each factor positively influences digitalisation. The standardised coefficients (β) reveal the relative strength of each predictor, with Organizational Culture ($\beta = 0.714$) having the most decisive influence, followed by Design Thinking ($\beta = 0.701$) and Knowledge Sharing ($\beta = 0.692$), indicating their substantial roles in driving digital transformation. The high t-values (ranging from 10.51 to 12.62) and the p-values of 0.00 for all variables suggest that all predictors are statistically significant, affirming that they each have a meaningful and positive impact on digitalisation.

Table 6: Coefficients

Variable	Unstandardised Coefficients (B)	Standardised Coefficients (β)	t	Sig.
(Constant)	0.648		5.612	0.00
Digital Leadership	0.424	0.684	12.62	0.00
Organisational Culture	0.361	0.714	10.51	0.00
Design Thinking	0.371	0.701	11.87	0.00
Knowledge Sharing	0.389	0.692	12.23	0.00

4.5 Discussion

The multiple regression analysis yields essential information about key elements driving organisational digitalisation. Digital Leadership, Organizational Culture, and Design Thinking Knowledge Sharing positively affect digital transformation protocols. Research conducted by Zhang and Wu (2023) and Schein (2010) confirms that leadership and organisational culture are crucial for digital change development. The study findings show Digital Leadership as the most influential variable in predicting digitalisation since it has a standardised coefficient 0.684. Previous studies demonstrate that leaders guide digital initiatives by creating strategic directions and constructing environments that encourage technology adoption (Zhang et al., 2023; Rösch et al., 2023). Digitalisation shows a strong dependence on Organizational Culture based on the result of a standardised coefficient of 0.714, according to Yi (2009), since cultural alignment with digital strategies leads to successful transformations. Modern digitalisation initiatives succeed when organisations encourage flexibility while promoting collaboration and innovation because these values build favourable conditions for new technological adoption. According to this research, organisations require a supportive cultural context that develops digital capabilities at every organisational level.

The statistical analysis indicates design thinking and knowledge sharing as key factors (β = 0.701 and β = 0.692, respectively) that influence digitalisation. Organisations applying design thinking methods to user-focused innovation and problem resolution have made it their essential method to fulfil digital requirements (Yao et al., 2024; Proksch et al., 2024; Tagscherer & Carbon, 2023; Santhose & Lawrence, 2023). Organisations demonstrating positive knowledge-sharing results have better opportunities to adapt transformational technologies and extract maximum value from digital platforms. The research findings show that digital transformation includes multiple dimensions that need exceptional leadership, organisational support, innovative strategies, and precise knowledge management. District authorities benefit from the practical application of these research results. Digital transformation requires organisations to invest in establishing digital leadership skills, innovative cultural development, and knowledge exchange between teams. A strategic integration of such elements will help organisations enhance their digital capabilities to transform smoothly into the digital era. The research enhances digital transformation literature through quantitative evidence, which identifies digital leadership, organisational culture, design thinking, and knowledge sharing as significant factors that drive digitalisation. Future studies should analyse these relations across different sectors and organisational situations to establish their general

validity and understand any extra elements that might affect digitalisation processes in distinct environments.

5. CONCLUSION AND RECOMMENDATIONS

The research investigates essential organisational elements for digital transformation by evaluating digital leadership, organisational culture, design thinking, and knowledge-sharing practices. Digital transformation advances rapidly because all variables support it effectively in a direct relationship, which proves that decisive leadership leads to positive cultures through innovative execution and knowledge-sharing methods. Strategic investments in digital leadership, organisational culture, design thinking, and knowledge sharing are imperative because they create favourable digital transformation ecosystems that enable organisations to embrace technological progress while staying competitive. This research provides beneficial recommendations to managers and policymakers for enhancing organisational digital capabilities. Additional research with expanded organisational perspectives and across various industrial landscapes will refine present knowledge about the driving factors of digitalisation.

6. LIMITATIONS AND FUTURE STUDIES

The study delivers a beneficial understanding of digitalisation drivers, yet it must be recognised that it contains several restrictions. The research delimits generalisation because it focuses on the Beijing region, potentially reducing applicability to other locations and organisations at different stages of digital operational evolution. The research depends on managerial-level employee self-reported data for its findings, but this approach might produce bias through human perception and limit observations of organisational interactions. Future investigations should increase the range of their subject sample by adding employees at diverse hierarchical positions and across different industries to research digital transformation better. The investigation calls for time-based research to study Digital Leadership with Organizational Culture and Design Thinking and Knowledge Sharing's lasting impacts on digital transformation across different periods. Further research should analyse how these elements function together with external market influences and processes of technological disruption to understand digitalisation's complex attributes better.

were assured that the information would only be used for research purposes. They were also told they could withdraw from the interview at any stage if they felt uneasy or did not want to continue.

Competing Interests: The author declares that this work has no competing interests.

Grant/Funding information: The author declared that no grants supported this work.

Data Availability Statement: The associated data is available upon request from the corresponding author.

Declaration Statement of Generative AI: The author(s) of this work declared that they did not use any AI tools except Grammarly to improve the language of the study.

REFERENCES

Abbu, H., Mugge, P., Gudergan, G., & Kwiatkowski, A. (2020, June). Digital leadership character and competency differentiate digitally mature organisations. In *2020 IEEE international conference on engineering, technology and innovation (ICE/ITMC)* (pp. 1-9). IEEE. https://doi.org/10.1109/ICE/ITMC49519.2020.9198576

AlNuaimi, B. K., Singh, S. K., Ren, S., Budhwar, P., & Vorobyev, D. (2022). Mastering digital transformation: The nexus between leadership, agility, and digital strategy. *Journal of Business Research*, *145(1)*, 636-648. https://doi.org/10.1016/j.jbusres.2022.03.038

Asif, M., Yang, L., & Hashim, M. (2024). The Role of Digital Transformation, corporate culture, and Leadership in Enhancing Corporate Sustainable Performance in China's Manufacturing sector. *Sustainability*, *16*(7), 2651. https://doi.org/10.3390/su16072651

Baker, J. (2011). The technology–organisation–environment framework. *Information Systems Theory: Explaining and Predicting Our Digital Society, Vol. 1*, 231-245. https://doi.org/10.1007/978-1-4419-6108-2_12

Bustard, J. R., Hsu, D. H., & Fergie, R. (2023). Design thinking innovation within the quadruple helix approach: A proposed framework to enhance student engagement through active learning in digital marketing pedagogy. *Journal of the Knowledge Economy*, *14*(3), 2463-2478. https://doi.org/10.1007/s13132-022-00984-1

Büyükbeşe, T., Dikbaş, T., Klein, M., & Ünlü, S. B. (2022). A study on digital leadership scale (DLS) development. *Kahramanmaraş Sütçü İmam Üniversitesi Sosyal Bilimler Dergisi*, *19*(2), 740-760. https://doi.org/10.33437/ksusbd.1135540.

Cahyadi, A., & Magda, R. (2021). Digital leadership in the economies of the G20 countries: Secondary research. *Economies, 9 (1), 32*. https:// doi.org/doi:10.3390/economies9010032

Cameron, K. S., Quinn, R. E., DeGraff, J., & Thakor, A. V. (2006). Competing values leadership: Creating value in organisations. In *Competing Values Leadership*. Edward Elgar Publishing. https://doi.org/10.4337/9781847201560

de Araujo, L. M., Priadana, S., Paramarta, V., & Sunarsi, D. (2021). Digital leadership in business organisations. *International Journal of Educational Administration, Management, and Leadership*, 45-56. https://doi.org/10.51629/ijeamal.v2i1.18

Deng, H., Duan, S. X., & Wibowo, S. (2023). Digital technology-driven knowledge sharing for job performance. *Journal of Knowledge Management*, *27*(2), 404-425. https://doi.org/10.1108/JKM-08-2021-0637

Eslami, M. H., Achtenhagen, L., Bertsch, C. T., & Lehmann, A. (2023). Knowledge-sharing across supply chain actors in adopting Industry 4.0 technologies: An exploratory case study within the automotive industry. *Technological Forecasting and Social Change*, *186*, 122118. https://doi.org/10.1016/j.techfore.2022.122118

Fang, L. (2023). Examining the effects of digital leadership strategies on enhancing organisational innovation performance. *Journal of Logistics, Informatics and Service Science*, *10*(4), 318-335. https://doi.org/10.33168/JLISS.2023.0422

Garg, P., Gupta, B., Sar, A., Graham, G., & Shore, A. P. (2024). Development and validation of an instrument to measure the perceived benefits of digitalisation in manufacturing. *IEEE Transactions on Engineering Management, 71*, 8288–8306. https://doi.org/10.1109/TEM.2024.3390434

Hensellek, S. (2020). Digital leadership: A framework for successful leadership in the digital age. *Journal of Media Management and Entrepreneurship (JMME)*, *2*(1), 1-15. https://doi.org/10.4018/JMME.2020010104

Hoe, S. L. (2006). Tacit knowledge, Nonaka and Takeuchi SECI model and informal knowledge processes. *International Journal of Organization Theory & Behavior*, *9*(4), 490-502. https://doi.org/10.1108/IJOTB-09-04-2006-B002

Iqbal, Q., & Piwowar-Sulej, K. (2023). Sustainable leadership and heterogeneous knowledge sharing: the model for frugal innovation. *European Journal of Innovation Management*, *26*(7), 655-673. https://doi.org/10.1108/EJIM-03-2022-0144

Kamble, S., Rana, N. P., Gupta, S., Belhadi, A., Sharma, R., & Kulkarni, P. (2023). An effectuation and causation perspective on the role of design thinking practices and digital capabilities in platform-based ventures. *Technological Forecasting and Social Change*, *193*, 122646. https://doi.org/10.1016/j.techfore.2023.122646

Kıyak, A., & Bozkurt, G. (2020). A general overview of the digital leadership concept. *Uluslararası Sosyal ve Ekonomik Çalışmalar Dergisi*, *1*(1), 84-95. https://dergipark.org.tr/tr/pub/gsijses/issue/72093/1160298

Leal-Rodríguez, A. L., Sanchís-Pedregosa, C., Moreno-Moreno, A. M., & Leal-Millán, A. G. (2023). Digitalisation beyond technology: Proposing an explanatory and predictive model for digital culture in organisations. *Journal of Innovation & Knowledge*, *8*(3), 100409. https://doi.org/10.1016/j.jik.2023.100409

Leso, B. H., Cortimiglia, M. N., & Ghezzi, A. (2023). The contribution of organisational culture, structure, and leadership factors in the digital transformation of SMEs: a mixed-methods approach. *Cognition, Technology & Work*, *25*(1), 151-179. https://doi.org/10.1007/s10111-022-00714-2

Liu, H., Zhu, Q., Khoso, W. M., & Khoso, A. K. (2023). Spatial pattern and the development of green finance trends in China. *Renewable Energy*, *211*, 370-378. https://doi.org/10.1016/j.renene.2023.05.014

Mollah, M. A., Choi, J. H., Hwang, S. J., & Shin, J. K. (2023). Exploring a pathway to sustainable organisational performance of South Korea in the digital age: The effect of digital leadership on IT capabilities and organisational learning. *Sustainability*, *15*(10), 7875. https://doi.org/10.3390/su15107875

Mortati, M., Magistretti, S., Cautela, C., & Dell'Era, C. (2023). Data in design: How big and thick data inform design thinking projects. *Technovation*, *122*, 102688. https://doi.org/10.1016/j.technovation.2022.102688

Nezafati, N., Afrazeh, A., Jalali, S. M. J., & Mohammad, J. (2009). A dynamic model for measuring the knowledge level of organisations based on the Nonaka and Takeuchi Model (SECI). *Scientific Research and Essays*, *4*(5), 531-542.

Nonaka, L., Takeuchi, H., & Umemoto, K. (1996). A theory of organisational knowledge creation. *International journal of technology Management*, *11*(7-8), 833-845. https://doi.org/10.1504/IJTM.1996.025472

Oliveira, T., & Martins, M. F. (2010, September). Information technology adoption models at the firm level: a literature review. In *The European conference on information systems management* (p. 312). Academic Conferences International Limited.

Proksch, D., Rosin, A. F., Stubner, S., & Pinkwart, A. (2024). The influence of a digital strategy on the digitalisation of new ventures: The mediating effect of digital capabilities and digital culture. *Journal of small business management*, *62*(1), 1-29. https://doi.org/10.1080/00472778.2021.1883036

Rösch, N., Tiberius, V., & Kraus, S. (2023). Design thinking for innovation: context factors, process, and outcomes. *European Journal of Innovation Management*, *26*(7), 160-176. https://doi.org/10.1108/EJIM-03-2022-0164

Santhose, S. S., & Lawrence, L. N. (2023). Understanding the implementations and limitations in knowledge management and sharing using a systematic literature review. *Current Psychology*, *42*(36), 32427-32442. https://doi.org/10.1007/s12144-022-04115-6

Schein, E. H. (2010). *Organisational culture and leadership* (Vol. 2). John Wiley & Sons.

Shin, J., Mollah, M. A., & Choi, J. (2023). Sustainability and organisational performance in South Korea: The effect of digital leadership on digital culture and employees' digital capabilities. *Sustainability*, *15*(3), 2027. https://doi.org/10.3390/su15032027

Tagscherer, F., & Carbon, C. C. (2023). Leadership for successful digitalisation: A literature review on companies' internal and external aspects of digitalisation. *Sustainable Technology and Entrepreneurship*, *2*(2), 100039. https://doi.org/10.1016/j.stae.2023.100039

Van Muijen, J. J. (1999). Organisational culture: The focus questionnaire. *European Journal of work and organisational psychology*, *8*(4), 551-568.

Vendraminelli, L., Macchion, L., Nosella, A., & Vinelli, A. (2023). Design thinking: a strategy for digital transformation. *Journal of Business Strategy*, *44*(4), 200-210. https://doi.org/10.1108/JBS-01-2022-0009

Vignoli, M., Dosi, C., & Balboni, B. (2023). Design thinking mindset: scale development and validation. *Studies in Higher Education*, *48*(6), 926-940. https://doi.org/10.1080/03075079.2023.2172566.

Wang, T., Lin, X., & Sheng, F. (2022). Digital leadership and exploratory innovation: From the dual perspectives of strategic orientation and organisational culture. *Frontiers in Psychology*, *13*, 902693. https://doi.org/10.3389/fpsyg.2022.902693

Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading digital: Turning technology into business transformation*. Harvard Business Press.

Yao, Q., Tang, H., Liu, Y., & Boadu, F. (2024). The penetration effect of digital leadership on digital transformation: the role of digital strategy consensus and diversity types. *Journal of Enterprise Information Management*, *37*(3), 903-927. https://doi.org/10.1108/JEIM-09-2022-0350

Yi, J. (2009). A measure of knowledge sharing behaviour: scale development and validation. *Knowledge Management Research & Practice*, *7*(1), 65-81. https://doi.org/10.1057/kmrp.2008.36

Zhang, C., Zhou, G., Li, J., Chang, F., Ding, K., & Ma, D. (2023). A multi-access edge computing enabled framework for constructing a knowledge-sharing intelligent machine tool swarm in Industry 4.0. *Journal of Manufacturing Systems*, *66*, 56-70. https://doi.org/10.1016/j.jmsy.2022.11.015