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Research Article

HYBRID MODELLING OF STUDENT SUPPORT SERVICES: CASE STUDY OF A DEVELOPING COUNTRY

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ABSTRACT

For Student Support Services (SSS), a hybrid model is not merely a temporary fix or a simple duplication of services online. It is an integrated, strategic approach that thoughtfully combines the best of both physical and virtual worlds. A hybrid model of student support services provides academic support, enhances equity and performance, improves institutional efficiency and provides a platform for the availability of data-driven insights for proactive policymaking and funding. This study proposes a novel Hybrid Student Support Services (H-SSS) model specifically tailored for the University of Guyana. Recognising the country's significant geographical dispersion, digital divide, and diverse student needs, the research integrates quantitative data analysis, including a structured survey of 203 students, and qualitative insights from faculty and administrators to develop a comprehensive framework for student support. Key quantitative findings reveal a significant utilisation gap in existing support services, with students who accessed services rating them more positively (Mean=3.41) than non-users (Mean=2.84), a difference that is statistically significant ($p < 0.001$). The study identifies communication and accessibility as critical drivers of perceived academic impact, while institutional capacity pressures linked to expanding free tertiary education present ongoing challenges. The finding also underscores the crucial role of hybrid services in providing adaptive, data-driven support interventions and frameworks that align institutional efforts with national goals. Institutions can build a more inclusive, adaptive, and powerful education ecosystem with the support of a well-planned hybrid model of SSS.

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1. Introduction

Higher education institutions (HEIs) globally are experiencing significant transformation driven by technological advancement, demographic changes, economic pressures, and increasing expectations for equitable access and improved student outcomes (Marshall, 2025).

In developing countries, universities face additional challenges associated with limited resources, expanding enrolments, changing labour market demands, and the need to strengthen institutional systems to support diverse student populations (Cvetkoska et al., 2026). As higher education expands from elite participation models toward broader access frameworks, institutions must develop innovative approaches to maintain quality, improve retention, and ensure meaningful student engagement. Student Support Services (SSS) represent a critical component of institutional effectiveness because they provide the structures through which students navigate academic, social, administrative, and personal challenges (Abusama & Remegio, 2026). These services commonly include academic advising, counselling, career guidance, financial assistance, disability support, student orientation, mentoring, and other mechanisms designed to facilitate student success. Effective support systems are not merely supplementary administrative functions; rather, they form part of the institutional ecosystem that shapes student experiences, persistence, and achievement.

The increasing importance of student support services is particularly evident in developing higher education systems where institutions must simultaneously manage expansion and quality assurance. Universities operating within rapidly changing environments face complex administrative and organisational pressures requiring adaptive institutional strategies (Goronga et al., 2025). Similarly, Mawudeku and Ankumah (2021) argue that administrative structures, including student support functions, play an essential role in improving academic performance and enhancing institutional outcomes. The relationship between student engagement and institutional effectiveness has long been recognised in higher education research. Astin's (1984) theory of student involvement emphasises that educational outcomes improve when institutions intentionally create opportunities for meaningful student interaction and participation. Likewise, Tinto (2012) highlights that student persistence is influenced not only by individual characteristics but also by the quality of institutional environments, relationships, and support structures.

However, many universities continue to rely on traditional models of student support that depend heavily on physical offices, manual processes, and student-initiated engagement (Hunn, 2026). While these approaches may have been effective under smaller enrolment conditions, they become increasingly difficult to sustain as universities experience rapid growth. With the availability of limited empirical research evidence guiding a shift towards a suitable approach, the situation will linger, impacting higher education. Further, the expansion of free or subsidised tertiary education policies in many developing countries has intensified these challenges by increasing student demand without proportional growth in institutional capacity. The University of Guyana provides an important case for examining these challenges. Guyana is experiencing unprecedented economic expansion due to oil wealth; amidst the country's ongoing economic transformation, the national institution continues to experience significant economic transformation, including increased demand for tertiary education linked to national development priorities. The university has encountered substantial growth in student numbers, while the introduction of free tertiary education has further accelerated enrolment, creating pressure on existing academic and administrative structures. Student Support Services is also impacted, as the services now need to respond to a larger and more diverse student population. A transformation of this scale amidst Guyana's wealth should

directly change the higher education learning environment and the services provided to support students' performance.

The current SSS operation in the institution presents several challenges as it historically operates through decentralised and largely in-person mechanisms. Faculties and administrative units are required to manage increasing student needs while operating under resource constraints. Communication gaps between academic departments and administrative units can delay service delivery, while students may remain unaware of available support mechanisms. Consequently, although support services may exist, accessibility and engagement barriers can limit their effectiveness. This study therefore explores how Student Support Services at the University of Guyana can be strengthened through a hybrid institutional model that combines digital technologies with human-centred support. The proposed Hybrid Student Support Services (H-SSS) model seeks to address three central challenges: increasing student demand, limited institutional capacity, and the need for proactive rather than reactive support.

The study is guided by the following objectives: To evaluate student perceptions and experiences of Student Support Services at the University of Guyana; To identify operational strengths and challenges affecting the delivery of student support; To develop a hybrid Student Support Services model capable of improving institutional efficiency and student success in developing higher education contexts.

Thus, using the University of Guyana as a case study, this research contributes to broader discussions on how universities in developing countries can redesign student services to support massification, digital transformation, and sustainable institutional development.

2. Research Methodology

2.1 Research Design

This study employed a mixed-methods research design to investigate the effectiveness of Student Support Services at the University of Guyana and to develop an evidence-based hybrid support model. The combination of quantitative and qualitative approaches allowed the research to examine both student perceptions and institutional realities. The quantitative component focused on measuring student experiences, perceptions, and factors influencing the effectiveness of Student Support Services, which aligns with the study's first objective. This was addressed through the administration of a structured quantitative survey capturing awareness, accessibility, communication effectiveness, utilisation patterns, and satisfaction levels across a diverse student sample. The qualitative component explored operational challenges, institutional capacity, and administrative perspectives regarding service delivery, aligning with the second objective. With the focus on identifying operational strengths and challenges affecting service delivery, the study explored these through semi-structured qualitative interviews with faculty and administrative staff who provided contextual insights into institutional capacities, resource constraints, and communication processes. The third objective aimed at developing a hybrid Student Support Services model capable of enhancing institutional efficiency and student success. This was pursued by integrating and triangulating quantitative and qualitative findings. Combining these methods thus offer a more comprehensive understanding than using either method alone, as each approach complements the other's strengths and offsets its limitations. The mixed-methods design enabled the

formulation of a data-driven, contextually relevant hybrid model that incorporates digital automation, proactive interventions, and specialised human support tailored to the developing country context. The approach is also appropriate because student support effectiveness involves both measurable outcomes and contextual institutional factors (after Kang & Park, 2026). Quantitative data provided statistical evidence of patterns, while qualitative data provided deeper explanations regarding why those patterns occurred (Pregoner, 2024). Thus, by integrating both methods, the study gains not only the ability to quantify service effectiveness and identify widespread challenges but also the nuanced understanding of institutional dynamics and human factors that shape those outcomes, leading to a more robust and actionable analysis.

2.2 Quantitative Component: Student Survey

A total of **203 students** participated in the study, validated by a faculty member. A sample size exceeding 200 is classified as adequate for survey research (Lee et al., 2010), as it satisfies the assumptions of the Central Limit Theorem ($n \geq 30$). The sample size is also practically feasible and manageable within the time and resource constraints of the study. The survey examined: awareness of Student Support Services; accessibility of services; communication effectiveness; utilisation patterns; perceived academic impact; overall satisfaction. The questionnaire used Likert-scale items to measure student perceptions, allowing statistical comparison between students who had used Student Support Services and those who had not. The main analytical techniques include:

- *Descriptive Statistics* – These were used to summarise student responses and identify general trends regarding service awareness, accessibility, and effectiveness.

- *Welch's t-test* - Welch's independent samples t-test was used to compare perceptions between: Students who used Student Support Services and Students who did not use Student Support Services.

The test was selected because it provides a robust comparison when the assumptions of equal variance between groups may not be satisfied (Ahad & Yahaya, 2014).

- *Multiple Linear Regression Analysis* - Regression analysis was conducted to identify the factors that best predicted the perceived academic impact of Student Support Services.

The independent variables examined included awareness, accessibility, and communication. These were measured through structured survey items using Likert scales to assess whether students knew about specific support services offered, how easy or difficult it was to access the Student Support Services and the students' views on the clarity, effectiveness, and timeliness of the communication related to Student Support Services. These measures allowed statistical analysis of how each factor influenced perceptions of the academic impact

of student support, and the analysis aimed to determine whether these factors significantly influenced students' perceptions of support effectiveness.

- *Analysis of Variance (ANOVA)* - ANOVA was used to determine whether accessibility perceptions differed among student cohorts. This assessed whether newer students experienced different levels of support access compared with students who had been enrolled longer.

2.3 Qualitative Component: Administrative and Faculty Interviews

To complement the student survey, semi-structured interviews were conducted with nine faculty members and university administrators**.** Participants were purposively selected across schools and faculties, as they hold different administrative positions and duties. These administrators provided insights into operational strengths of current support systems, institutional challenges, staffing limitations, communication processes, and future sustainability concerns. The qualitative component was particularly important because student perceptions alone may not reveal underlying institutional constraints. Interview data were analysed through thematic coding and analysis. Responses were coded according to emerging themes, including service effectiveness; communication barriers; resource limitations; administrative coordination; institutional capacity. Themes were validated by a faculty member and supported through methodological triangulation. This cross-verification ensured the reliability and contextual relevance of the themes, as it showed alignment between student perceptions and administrative experiences.

2.4 Data Integration and Triangulation

The study applied methodological triangulation by comparing quantitative and qualitative findings. This approach strengthened the reliability of the research by examining whether statistical patterns aligned with institutional experiences. For example, the quantitative survey revealed significant issues regarding accessibility and communication in Student Support Services. The regression analysis showed that accessibility ($\beta = 0.357$) and communication ($\beta = 0.360$) were key predictors of students perceived academic impact, while awareness alone was not significant. Correspondingly, the qualitative interviews with faculty and administrators provided explanations for these accessibility and communication challenges. Thus, the qualitative findings elucidated the institutional causes behind the quantitative patterns, confirming convergence between datasets, and strengthening the need for a hybrid model addressing both technological and human resource factors in Student Support Services.

3. Results and Findings

3.1 Finding One: The Student Support Services Utilisation Gap

One of the most significant findings was the difference in perceptions between students who used Student Support Services and those who did not. The analysis showed: **SSS Users:** Mean perception score (M) = **3.41; Non-users:** Mean perception score (M) = **2.84;** The

difference was statistically significant: **$p < 0.001$.** These scores underline a critical engagement gap, indicating that students who accessed Student Support Services viewed them significantly more positively than those who did not. The finding suggests that existing services are effective when students engage with them. Students who interact with the support unit experience direct benefits, including guidance, assistance, and improved institutional navigation. However, the lower perception among non-users indicates a major engagement challenge. The issue does not necessarily reflect poor service quality but rather limited visibility, outreach, and initial connection with students. The qualitative findings supported this interpretation. Administrators described Student Support Services as functioning effectively and serving as a 'big brother' system for students. However, they also highlighted barriers such as student apathy, lack of awareness, and limited proactive engagement. This suggests that the university's challenge is shifting from simply providing services to ensuring that students are connected with those services. The implication is also significant, indicating that an effective support service that remains underutilised cannot fully achieve institutional objectives. Bridging this gap is therefore essential for improving institutional effectiveness and student success.

Additionally, given the study's objective to develop a data-driven hybrid SSS model with predictive elements, it is essential to indicate that there is a 95% confidence interval (Welch's) for the mean difference among users. SSS users have significantly more positive perceptions of support services across all 5 items in the survey. The largest difference is in effective communication (Diff=0.700, $p<0.0001$) and accessibility/convenience (Diff=0.656, $p<0.0001$). This confirms that users benefit from SSS, hence, bridging the utilisation gap becomes necessary for institutional advancement.

3.2 Finding Two: Communication and Accessibility as Critical Drivers

The regression analysis examined which factors best predicted students' perception of academic impact. The findings indicated that communication and accessibility were stronger predictors than awareness alone**.** The results showed: Accessibility: $\beta =$ **0.357** indicates that a one-unit improvement in perceived accessibility of services corresponds to a 0.357-unit increase in perceived academic impact; Communication: $\beta = 0.360$. This result means that for every one-unit increase in students' perception of communication effectiveness, there is an associated increase of 0.36 units in their perceived academic impact of the support services; Awareness: $p = 0.607$. For awareness, the result is not a significant predictor, suggesting that just knowing about services does not strongly influence perceptions of academic impact. This highlights an important distinction between **Service awareness** and **Service usability.** A student may know that counselling, advising, or academic support exists, but still fails to use it because processes are unclear, response times are slow, communication channels are ineffective, and referrals between departments are delayed. The qualitative findings reinforced this issue. Faculty members identified communication breakdowns between academic departments and administrative offices as a major constraint. The examples included delayed information flow, unclear responsibilities, and slow activation of support mechanisms. Therefore, improving communication infrastructure is not merely an administrative improvement; it is central to improving student success outcomes.

3.3 Finding Three: Capacity Pressure and the Expansion of Free Tertiary Education

The third major finding relates to institutional capacity.

The ANOVA results showed **p = 0.433**, indicating the result of an Analysis of Variance (ANOVA) assessing whether perceptions of accessibility to Student Support Services differ among different student cohorts. This suggests there was no statistically significant difference in accessibility perceptions between different student cohorts. In practical terms, newer students did not perceive accessibility as significantly worse than that of earlier students. However, qualitative findings revealed a different institutional reality. Administrators reported increasing student numbers, severe staffing pressures, growing administrative workload, and limited capacity to maintain personalised support (Samples of responses A – "At this point, UG's capacity is minimal due to understaffing and cannot support the significant increase in student population that is to come," B – "The university's ability to handle increased enrollment depends on receiving additional resources for staff recruitment and addressing the already strained staff-to-student ratio.") These reveal that while students' perceptions remain unchanged for now, the institution faces sustainability challenges that may eventually affect service quality and accessibility. This creates a potential sustainability challenge. The current system may appear stable from the student's perspective because staff members are compensating through increased effort; however, continued enrolment growth may exceed institutional capacity. The introduction of free tertiary education has therefore created both an opportunity and a challenge: **Opportunity:** Greater access to higher education. **Challenge:** Ensuring institutional systems expand at the same pace as student demand, as without structural reform, student support systems risk becoming overwhelmed.

4. The Proposed Hybrid Student Support Services (H-SSS) Model

Based on the findings, this study proposes a Hybrid Student Support Services (H-SSS) model designed specifically for universities experiencing rapid growth and resource constraints. The model combines: Digital automation, data-driven intervention, and Human-centred specialised support. The goal is not to replace human interaction but to strategically allocate institutional resources by allowing technology to manage routine processes while staff focus on complex student needs. The proposed model consists of three integrated tiers (Figure 1).

4.1 Tier 1: Digital Automated Triage and Self-Service

The first tier focuses on improving accessibility through digital platforms. Many student enquiries involve routine administrative processes, such as registration information, academic procedures, service availability, deadlines, referrals, and frequently asked questions. These activities consume significant staff time when handled manually. A digital self-service system can provide online knowledge bases, automated responses, virtual assistants, digital forms, appointment scheduling, and online tracking of requests. For instance, mobile apps are accessible even in low-bandwidth environments and align well with the high mobile phone penetration. Communication companies such as One-Communication and Digicel can collaborate with the university's system to develop a dedicated mobile application that can

serve as a centralised digital platform where students access information on academic advising, counselling, financial aid, and career services. Since Moodle is also a popular open-source Learning Management System already in use in the institution, integrating student support functionalities directly into Moodle would streamline students' academic and support experiences. Amidst the national digital divide, an SMS-based notification and query system can be valuable to remind students with limited internet access about deadlines and available services. An approach such as the aforementioned reduces administrative workload while allowing students immediate access to information. Karp and Stacey (2023) emphasise that effective institutional navigation requires students to easily understand where and how to access support. Digital systems can simplify this navigation process by creating a single access point for student services. For the University of Guyana, a digital SSS platform could integrate student information systems for academic advising, counselling referrals, financial support information, and career services. The expected outcome is faster response times and improved student experience.

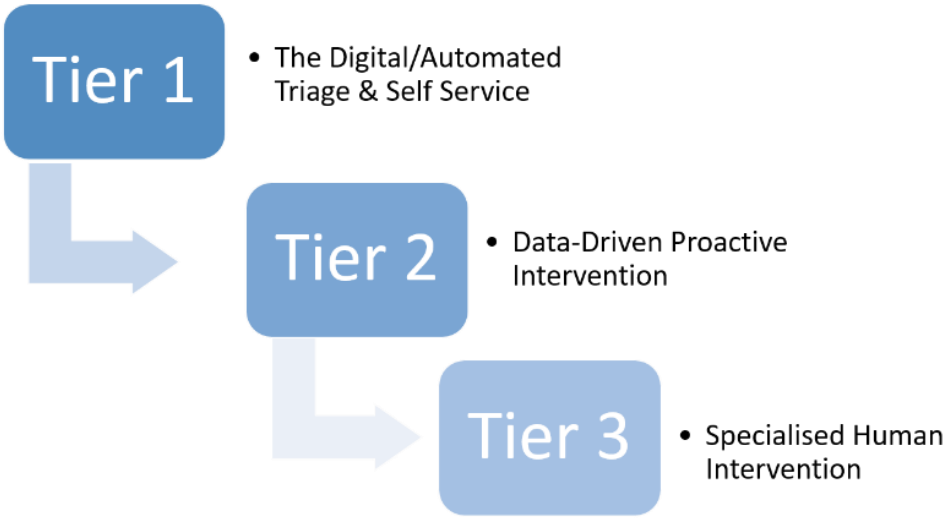


Figure 1: Proposed Hybrid SSS Model

4.2 Tier 2: Data-Driven Proactive Intervention

The second-tier shifts student support from reactive to predictive. Traditional support models respond after students experience difficulties. A hybrid model uses available institutional data to identify potential challenges earlier. Through learning analytics and student information systems, universities can monitor indicators such as declining academic performance, repeated course failures, low engagement, missed assessments, GPA below 2.0, attendance < 80%, missed assignments and reduced participation. Students identified as requiring assistance can receive targeted interventions. For example, a student showing declining academic performance may automatically receive an academic advising notification, tutoring recommendation, counselling referral, and study skills support. Arnold and Pistilli (2012) show that learning analytics can improve student success by identifying risk factors earlier. However, data-driven support must be implemented ethically. Students should be fully

informed about how their data is collected and used; Importantly, students must have the ability to voluntarily consent to data sharing and retain the choice to opt out of automated support systems to protect their privacy and autonomy. Similarly, universities must ensure student privacy, transparency, responsible data use and appropriate governance. Technology should enhance student support rather than create surveillance systems.

4.3 Tier 3: Specialised Human Intervention

While technology improves efficiency, some students' needs require personal interaction. The third tier, therefore, focuses on specialised human support. This includes academic counselling and planning services provided by the Faculty, mental health support, disability services, career guidance, and personal interventions provided by different units of the student's welfare service. These staff members manage high-impact or interconnected student needs that cannot be effectively addressed through automated systems alone, ensuring a holistic and human-centred approach to student support. Human expertise remains essential because student challenges are often interconnected and cannot be solved through automated systems alone. Cuseo (2015) argues that successful student support requires holistic approaches, recognising students as complete individuals rather than isolated academic participants. The hybrid model therefore ensures that technology handles routine interactions while trained professionals focus on high-impact cases. Thus, the automation in Tiers 1 and 2 of the Hybrid Student Support Services (H-SSS) model will significantly alleviate staff workload, thereby freeing human resources for more complex cases in Tier 3. Together, these automated systems will optimise operational efficiency, allowing specialised staff in Tier 3 to concentrate their expertise and attention on personalised, high-impact interventions like mental health counselling or complex academic advising, which require human judgment and holistic understanding.

5. Conclusion

This study set out to examine and demonstrate the value of a hybrid modelling framework for improving the understanding, simulation, and decision-support capacity of complex systems, as presented in the earlier sections of this manuscript. The study provides an empirically grounded, context-sensitive hybrid model for Student Support Services tailored specifically for developing countries. The findings from the conceptual and empirical studies suggest that hybrid models offer a more robust pathway for balancing interpretability and predictive performance. Traditional process-based models provide theoretical rigour and explanatory strength, while data-driven components enhance adaptability and responsiveness to complex patterns in empirical datasets. When combined, these approaches improve the overall model reliability, particularly in contexts where uncertainty, data sparsity, and system complexity are significant constraints. Furthermore, the study highlights the importance of interdisciplinary integration in modelling practice. Effective implementation of hybrid frameworks requires not only technical integration but also conceptual alignment across disciplines such as environmental science, geospatial analytics, and computational modelling. Ultimately, the hybrid approach presented here provides a scalable foundation for enhanced decision support in research and applied policy contexts. Despite the contributions of the study,

several limitations are acknowledged. One key limitation is the reliance on conceptual and semi-empirical validation rather than full-scale operational deployment in multiple real-world case studies. While the framework demonstrates theoretical and applied coherence, broader validation across diverse datasets and geographic contexts would strengthen its generalizability. A second limitation relates to data dependency. Hybrid models, particularly those incorporating machine learning components, require sufficiently high-quality datasets for training, calibration, and validation. In contexts where data is sparse, inconsistent, or fragmented, model performance may be constrained or require additional processing and assumption-based adjustments.

Third, the integration of heterogeneous modelling components introduces computational and interpretational complexity. This may limit accessibility for practitioners without advanced technical expertise or adequate computational infrastructure. Future research should therefore focus on expanding empirical applications of the framework across different environmental and socio-economic contexts. Comparative studies between standalone, process-based, and hybrid models would also help quantify performance improvements more rigorously. Additionally, further work should explore automation strategies for model integration, including the use of artificial intelligence for dynamic parameter tuning and uncertainty quantification. Also, cross-institutional comparisons would provide valuable insights by examining how the model performs across diverse higher education settings, enabling identification of contextual factors influencing success and facilitating refinement of best practices. Finally, there is a need for stronger engagement between model developers and end-users, particularly policymakers and institutional stakeholders, to ensure that hybrid modelling outputs are both scientifically robust and operationally relevant.

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