The Prevalence and Psychological Impact of Smartphone Addiction among University Students in Ghana. A Case Study of Kumasi Technical University (KSTU).

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ABSTRACT

Purpose: This study investigates the prevalence of smartphone addiction and its psychological impacts among students at Kumasi Technical University.

Design/Methodology/Approach: A concurrent quantitative design using a structured questionnaire was employed. Stratified random sampling selected 333 students. Descriptive statistics and Pearson correlation analyses were conducted using SPSS to examine prevalence levels and relationships between smartphone addiction and psychological outcomes.

Findings: Results indicate a high prevalence of smartphone addiction among students, significantly associated with anxiety, depression, stress, sleep disturbances, and reduced academic performance. Peer influence, social media culture, and societal expectations strongly shaped usage patterns. Females and younger students showed higher dependency levels.

Originality: This study provides Ghana-specific empirical evidence on smartphone addiction by integrating prevalence, psychological effects, and socio-cultural drivers within a unified analytical framework, addressing a major contextual gap in African higher education research.

Practical Implications: The findings support the need for digital well-being policies, counselling interventions, peer-led awareness programs, and structured smartphone-based learning strategies to promote responsible usage, improve mental health, and enhance academic productivity among university students.

Research Limitations: The cross-sectional design limits causal inference, and reliance on self-reported data may introduce response bias. The study focused on a single institution, restricting generalisability. Future research should adopt longitudinal, multi-site, and mixed qualitative approaches to deepen contextual understanding.

Keywords: Anxiety, Students, Ghana, Well-Being, Smartphone Addiction

INTRODUCTION

The rapid diffusion of smartphones has transformed communication, learning, and social interaction among young people worldwide (Islamiah *et al.*, 2024). For university students, smartphones function not only as communication tools but also as learning platforms, entertainment devices, and social connectors. While these technologies offer substantial academic and social benefits, their excessive and uncontrolled use has raised

concerns about problematic dependency and addiction. Smartphone addiction, often conceptualised as a form of behavioural addiction, is associated with compulsive use, loss of control, withdrawal symptoms, and functional impairment (Akgul, 2025). Globally, studies have linked excessive smartphone use to psychological problems such as anxiety, depression, stress, and sleep disturbances, which can undermine students' academic performance and well-being (Elamin *et al.*, 2023).

Despite the growing international literature, empirical evidence on smartphone addiction within sub-Saharan African contexts remains limited, particularly in Ghana. Most existing studies focus on Western and Asian populations, often neglecting the socio-cultural, economic, and educational conditions that shape smartphone use in African universities (Hsieh, 2025). Furthermore, few Ghanaian studies simultaneously examine prevalence, psychological outcomes, and socio-cultural drivers in an integrated framework. This gap limits the development of contextually appropriate interventions and policies tailored to Ghanaian higher education institutions.

Against this background, this study aims to investigate the prevalence and psychological impact of smartphone addiction among students at Kumasi Technical University. Specifically, it seeks to determine the level of smartphone addiction, examine its effects on anxiety, depression, stress, and sleep quality, and identify the socio-cultural factors contributing to problematic use. The study contributes to the literature by offering Ghana-specific empirical evidence, enriching theoretical debates on behavioural addiction in emerging economies, and providing practical insights for student counselling services, academic policy design, and digital well-being initiatives.

The study is anchored in the I-PACE model of behavioural addiction, which posits that problematic technology use emerges from the interaction of personal characteristics, affective and cognitive responses, and executive control processes (Brand *et al.*, 2016). Additionally, Uses and Gratifications Theory explains how students actively engage with smartphones to satisfy psychological and social needs such as belongingness, entertainment, and stress relief (Bhatiasevi, 2024). These frameworks jointly guide the interpretation of addictive patterns and psychological outcomes among students. By contextualising smartphone addiction within Ghana's socio-cultural and academic environment, this research advances understanding of digital dependency in African higher education. It supports the development of evidence-based strategies for mental health and technology governance.

The remainder of this paper is structured as follows: Section two reviews relevant literature on smartphone addiction, its psychological effects, and associated socio-cultural factors among university students. Section three describes the study area, research design, sampling procedures, instruments, and data analysis methods. Section four presents the results and discusses the findings in relation to existing literature and theoretical perspectives. Section five outlines the implications for policy, practice, and student support services, and offers recommendations for intervention. Finally, Section six concludes the study by summarising the key contributions, acknowledging limitations, and suggesting directions for future research.

LITERATURE REVIEW

The rapid advancement of digital technologies has significantly reshaped patterns of communication, learning, entertainment, and social interaction, particularly among young adults (Shabur and Siddiki, 2024). Smartphones, as multifunctional and portable digital devices, have become integral to everyday life, offering instant access to information, social networking platforms, educational resources, and entertainment (Wang *et al.*, 2022). For university students, smartphones play a central role in academic engagement, peer interaction, identity formation, and emotional regulation. While these devices provide substantial benefits, concerns have emerged regarding their excessive and maladaptive use, commonly conceptualised as smartphone addiction or problematic smartphone use (PSU) (Padmanabhanunni and Pretorius, 2025). This phenomenon is increasingly recognised as a behavioural dependency characterised by compulsive usage, impaired self-control, emotional reliance, and functional disruption.

Globally, smartphone addiction has been associated with a range of adverse psychological, social, and academic outcomes, including anxiety, depression, stress, sleep disturbances, reduced academic performance, and social

withdrawal (Giansanti, 2025). These outcomes are particularly salient among university students, who often experience heightened academic demands, transitional life stressors, and increasing social pressures. Smartphones frequently serve as coping tools for emotional discomfort, boredom, loneliness, and social anxiety, thereby reinforcing dependency patterns. The COVID-19 pandemic further intensified this reliance, as remote learning, social distancing, and digital communication became dominant modes of engagement (Asimakopoulos *et al.*, 2025).

Despite the expanding body of international research, empirical evidence from sub-Saharan Africa remains limited, with Ghanaian universities largely underrepresented in the literature. Most existing studies are situated within Western, Middle Eastern, and Asian contexts, which differ substantially in terms of socio-cultural norms, technological infrastructure, educational systems, and peer dynamics (Jiang *et al.*, 2025). These contextual differences limit the generalisability of existing findings to Ghanaian students. Furthermore, few studies have integrated prevalence, psychological outcomes, and socio-cultural drivers within a unified analytical framework. This gap constrains the development of culturally sensitive interventions and institutional policies.

This chapter critically reviews existing literature on smartphone addiction, its psychological implications, and its relevance to higher education. It synthesises theoretical foundations, conceptual debates, empirical evidence, and contextual dynamics to establish the scholarly grounding for the present study. The review also identifies key gaps that warrant a focused investigation among students at Kumasi Technical University.

Conceptualising Smartphone Addiction and Problematic Smartphone Use

Smartphone addiction is commonly conceptualised as a form of behavioural addiction, marked by excessive use, impaired control, preoccupation, tolerance, withdrawal-like symptoms, and continued engagement despite negative consequences (Giansanti, 2025). Although it is not formally classified in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), its behavioural patterns closely mirror those of recognised addictive disorders such as gambling and internet gaming disorder (Petry *et al.*, 2015). The portability, affordability, and constant internet connectivity of smartphones differentiate them from earlier digital technologies, significantly amplifying the potential for compulsive engagement.

Problematic smartphone use (PSU) has emerged as a broader conceptual umbrella that captures maladaptive patterns without necessarily implying clinical addiction. Billieux et al. (2015) argue that PSU encompasses compulsive checking, emotional reliance, procrastination, and attentional disruptions that interfere with daily functioning (Ndayambaje and Okereke, 2025). This perspective is particularly relevant in academic contexts, where frequent interruptions from notifications, social media platforms, and entertainment applications undermine concentration, time management, and cognitive engagement.

Technological advancements have also generated new pathological constructs associated with smartphone overuse, including nomophobia (fear of being without one's phone), fear of missing out (FOMO), ringxiety (phantom vibration or ringing), and textiety (anxiety associated with delayed message responses (Gutiérrez *et al.*, 2016; Kaviani *et al.*, 2020). These constructs reflect the emotional and cognitive dependencies that sustain compulsive smartphone behaviours. Such dependencies often serve as maladaptive coping strategies for stress, loneliness, boredom, and social discomfort.

Theoretical Foundations of Smartphone Use and Addiction

Understanding smartphone addiction requires a multi-theoretical approach that integrates technological, psychological, and socio-behavioural perspectives. This study draws primarily on the Technology Acceptance Model (TAM), cognitive-behavioural theory, Uses and Gratifications Theory, and self-regulation frameworks.

The Technology Acceptance Model (TAM), developed by Davis et al. (1989), posits that individuals' intention to adopt and use a technological system is primarily determined by perceived usefulness and perceived ease of use. In educational contexts, TAM has been widely applied to explain students' engagement with learning management systems, mobile learning platforms, and digital resources (Mugo *et al.*, 2017). Smartphones are often perceived as useful due to their multifunctionality, flexibility, and convenience, while their intuitive

interfaces enhance perceived ease of use. These attributes promote adoption but may simultaneously increase vulnerability to excessive use.

From a psychological standpoint, Davis's (2001) cognitive-behavioural model of pathological internet use provides valuable insights into the mechanisms underlying digital addiction. The model identifies maladaptive cognitions such as distorted self-perceptions, negative self-evaluations, and escapist worldviews as central drivers of compulsive use. Individuals with low self-efficacy, high social anxiety, or depressive tendencies may rely on smartphones as tools for emotional regulation, distraction, and social compensation (Liu and Baharudin, 2025).

Complementing this, Uses and Gratifications Theory emphasises that individuals actively choose media to satisfy specific psychological and social needs, including belongingness, entertainment, self-presentation, and stress relief (Falgoust *et al.*, 2022). Among university students, smartphones fulfil academic, relational, and emotional functions simultaneously, reinforcing habitual engagement. Media Dependency Theory further suggests that the more individuals rely on media to meet core needs, the more influence that medium exerts on their behaviour (Ma *et al.*, 2023).

Self-regulation theory also provides critical explanatory value. According to Kwasnicka *et al.* (2016), individuals continuously monitor and evaluate their behaviours against internal standards. When self-regulatory capacity is compromised, individuals may resort to avoidance strategies, including digital escapism. Smartphones, being readily available, become convenient tools for emotional disengagement, particularly in socially or academically stressful situations (Wolfers *et al.*, 2020).

Evolution of Smartphones and Their Educational Transformation

The evolution of smartphones reflects the convergence of telephony and computing technologies. Early mobile devices in the 1970s and 1980s primarily supported voice communication. However, the introduction of internet-enabled systems in the late 1990s and early 2000s transformed mobile phones into multifunctional digital platforms (Teodorescu *et al.*, 2023). The release of the iPhone in 2007 and the Android operating system marked a critical milestone in the modern smartphone era, facilitating the rapid expansion of application ecosystems.

Contemporary smartphones integrate internet access, multimedia production, social networking, gaming, GPS navigation, cloud storage, and productivity tools. These capabilities have redefined how students interact with information, instructors, and peers. O'Dea (2020) reports that Android and iOS dominate the global market, making smartphones widely accessible across socioeconomic groups (Campbell-Kelly *et al.*, 2014).

In higher education, smartphones have increasingly complemented or replaced traditional computing devices (Gikas and Grant, 2013). Students now access lecture materials, participate in virtual classrooms, conduct research, submit assignments, and collaborate through mobile platforms. These affordances support flexible, self-directed learning, but they also introduce new distractions that can undermine academic discipline.

Smartphones and Mobile Learning in Higher Education

Mobile learning (m-learning) refers to the use of portable digital devices to facilitate learning across time and space boundaries (Moya and Camacho, 2024). Smartphones are particularly well-suited for this purpose due to their constant availability, battery efficiency, and application diversity (Xia *et al.*, 2013). Students can store academic materials, access learning management systems, collaborate on tasks, and participate in assessments remotely.

Empirical studies consistently highlight the academic benefits of smartphone use. Mbinda *et al.* (2024) found that smartphones enhanced learning flexibility and student satisfaction. Similarly, students reported improved peer communication, information sharing, and concept clarification (Parmar *et al.*, 2025). In Ghana, it was observed that smartphones enabled students to engage in independent research and proactive learning.

However, these benefits coexist with significant risks. Upshaw *et al.* (2022) warn that excessive reliance on smartphones can lead to cognitive overload, reduced attention spans, and poor time management. The same

features that enable learning also facilitate entertainment, social media engagement, and gaming, often competing with academic priorities.

Psychological Impacts of Smartphone Addiction

A central concern in smartphone addiction research is its relationship with students' psychological well-being. University students are developmentally and socially positioned at a stage characterised by identity formation, heightened peer influence, academic pressure, and increased exposure to uncertainty, making them particularly susceptible to behavioural dependencies. Evidence consistently links problematic smartphone use with anxiety, depression, stress, poor sleep quality, and reduced psychosocial functioning (Nikolic *et al.*, 2023).

Anxiety and depression. Multiple studies suggest that excessive smartphone engagement is associated with heightened anxiety and depressive symptoms. Higher smartphone addiction scores were significantly related to increased anxiety and depression among university students (Elamin *et al.*, 2023). Similarly, Augner *et al.* (2021) argue that smartphone overuse often co-occurs with emotional vulnerability, including anxiety and depressive symptomatology, partly because smartphones facilitate reassurance-seeking, avoidance coping, and persistent social comparison. In Ghanaian contexts, emerging university-based evidence also suggests that students who report problematic smartphone habits tend to exhibit higher anxiety and depressive indicators. However, comprehensive institutional-level studies remain limited (Shabani *et al.*, 2025). This signals a need for contextualised work that disentangles whether smartphone addiction serves as a driver of psychological distress, a coping response to distress, or both.

Sleep quality and fatigue. Sleep disruption is among the most consistently reported consequences of smartphone addiction. Lanaj et al. (2014) show that late-night smartphone use predicts poorer sleep quality and reduced well-being the next day. Mechanistically, blue-light exposure and prolonged cognitive arousal delay sleep onset, while habitual checking can fragment sleep through nighttime awakenings (Silvani *et al.*, 2022). Ghanaian evidence similarly suggests that students with higher smartphone dependence report poorer sleep and increased daytime fatigue (Owusu-Marfo, 2017). In university settings, this pattern can produce a cascading effect, with poor sleep contributing to reduced attention, heightened irritability, and diminished academic productivity.

Social isolation and relational strain. Although smartphones are designed to enhance social connections, excessive use can diminish the quality of face-to-face relationships and increase loneliness. (Zhen *et al.*, 2021) link smartphone addiction to loneliness and social isolation, suggesting that heavy reliance on mediated interaction can displace deeper interpersonal contact. In Ghana, where campus life is shaped by peer networks, group learning, and social belonging, an overreliance on digital connections may paradoxically weaken students' offline support structures, thereby reinforcing emotional vulnerability (Afful and Boateng, 2023).

Smartphones, Academic Functioning, and Psychosocial Vulnerability

Smartphone use among university students presents a complex duality, often described as a "double-edged sword." On one hand, smartphones facilitate flexible access to learning resources, enhance peer collaboration, and improve lecturer–student communication (Au *et al.*, 2015). Students commonly use these devices to download lecture materials, record classes, access slides, search for academic resources, and coordinate group assignments. Studies by Edeh et al. (2024) further demonstrate that smartphones support academic administration through access to timetables, announcements, assessments, and institutional updates, thereby enhancing engagement and organisational efficiency.

Conversely, smartphones also function as persistent sources of distraction, particularly through social media, gaming, and entertainment applications. Kibona and Mgaya (2015) conceptualise this dual role as a "double-edged sword," where academic utility coexists with addictive distraction. Empirical evidence indicates that excessive smartphone use is associated with poorer academic performance, heightened anxiety, and lower grade point averages. Students often perceive their devices as undermining study discipline due to constant notifications, multitasking, and fragmented attention (Martin *et al.*, 2025). These findings suggest that the central challenge lies not in smartphone ownership itself but in students' capacity for self-regulation and attentional control amid persistent digital cues.

Beyond academic functioning, smartphone addiction is deeply embedded in psychosocial processes shaped by socio-cultural expectations and emotional coping strategies. Uses and Gratifications Theory explains that students engage with smartphones to fulfil needs for belonging, esteem, entertainment, information, and emotional relief (Falgoust *et al.*, 20220). In the Ghanaian university context, these motivations are reinforced by peer-group norms, online reputation management, and constant interaction through platforms such as WhatsApp, Instagram, and TikTok. Peer influence further intensifies usage patterns, as Gunawan *et al.* (2023) demonstrate that social norms significantly shape technology adoption and engagement frequency.

Psychological vulnerability also plays a crucial role. Rapee and Heimberg's (1997) model of social anxiety suggests that fear of negative evaluation and self-consciousness can drive avoidance behaviours. Similarly, Carver and Scheier's (1981) self-regulation framework explains how individuals disengage from challenging offline situations when they perceive a gap between their coping capacity and the demands of the situation (Scoular *et al.*, 2025). Smartphones provide an easily accessible escape, enabling students to withdraw into mediated interactions, thereby reinforcing avoidance coping and dependency. From an interpersonal communication perspective, maladaptive online interaction patterns can weaken offline relationships and perpetuate anxiety cycles. Collectively, these perspectives indicate that smartphone addiction is not merely a technological issue, but a psychosocial phenomenon shaped by emotional vulnerability, cultural norms, and social pressures.

Post-Pandemic Intensification, Empirical Patterns, and Research Gaps

The COVID-19 pandemic significantly intensified students' reliance on smartphones due to remote learning, social distancing, and reduced physical mobility (Saadeh *et al.*, 2021). Smartphones became essential tools for academic continuity, social connection, and entertainment, but this increased exposure also heightened the risk of compulsive use. Pandemic-era studies consistently report increases in screen time, problematic smartphone behaviours, and psychological distress, including anxiety, loneliness, and stress (Burns *et al.*, 2025). For students, the boundaries between academic and non-academic smartphone use became increasingly blurred, as learning management systems coexisted on the same device with social media and gaming platforms. In Ghana, these patterns were further shaped by infrastructural challenges such as high data costs and unstable internet connectivity, which could exacerbate frustration and encourage escapist usage.

Importantly, these behavioural shifts have not fully reversed in the post-pandemic period; instead, smartphone-mediated learning and constant digital connectivity have become normalised, reinforcing the need for institutional strategies that promote digital well-being, self-regulation, and balanced technology use (Torous *et al.*, 2025).

Empirical studies on smartphone addiction reveal several consistent themes. First, problematic smartphone use is associated with reduced self-regulated learning, weakened attentional control, and diminished academic flow (Kong *et al.*, 2025). Second, strong links exist between smartphone addiction and mental health challenges, including anxiety, depression, stress, and sleep disturbances (Nikolic *et al.*, 2023). Third, socio-demographic and contextual variables such as gender, income, perceived social status, and daily usage duration significantly influence addiction prevalence (Harada *et al.*, 2023). However, findings on academic outcomes remain mixed, with some studies identifying motivational and performance benefits when smartphone use is structured and task-oriented, particularly in controlled learning environments.

Despite these insights, important methodological and contextual gaps persist. Most existing studies use cross-sectional survey designs, which limit causal inference. Samples are often narrow, drawn from single institutions or restricted demographic groups, reducing the generalizability. In the Ghanaian context, research remains limited and tends to focus primarily on prevalence or academic outcomes without integrating psychological impacts and socio-cultural drivers into a unified explanatory model. This gap is particularly relevant for KsTU, where institutional culture, peer norms, and academic stressors may interact uniquely to shape smartphone use patterns. Addressing this gap is critical for developing context-sensitive interventions and evidence-based digital well-being policies.

Conceptual Framework and Link to the Present Study

Building on the reviewed literature, the present study conceptualises problematic smartphone use as the independent variable and psychological outcomes (anxiety, depression, stress, and sleep quality) as core dependent outcomes, while also examining socio-cultural drivers that shape usage patterns. Consistent with cognitive-behavioural and self-regulation perspectives, socio-cultural factors and individual vulnerability can function as enabling conditions that increase reliance on smartphones as coping tools (Al-Abyadh *et al.*, 2024). Gender and baseline anxiety may also modify the strength of these relationships, as suggested by demographic findings in the literature (Ogunrinde *et al.*, 2025). This framing aligns with the study's objectives of determining prevalence, assessing psychological impacts, and identifying socio-cultural contributors among KsTU students.

The current study focused on establishing whether there was a relationship between problematic smartphone use and social anxiety. In this case, problematic smartphone use was the independent variable, and social anxiety was the dependent variable. Gender and the level of social anxiety were considered as modifiers in this conceptual framework. The conceptual framework for this study is shown.

The conceptual framework for this study explains the relationship between problematic smartphone use and social anxiety disorder among students, while recognising the intervening role of gender differences in problematic smartphone use. In the framework, problematic smartphone use is treated as the independent variable because it represents the main behavioural condition under examination.

It refers to excessive, uncontrolled, or compulsive smartphone engagement that may interfere with students' academic, psychological, and social functioning. Social anxiety disorder is treated as the dependent variable because the study seeks to determine whether problematic smartphone use is associated with increased fear, discomfort, or avoidance in social situations.

The framework suggests that students who engage in problematic smartphone use may become more dependent on digital communication and less confident in direct face-to-face interaction. Excessive reliance on smartphones may encourage social withdrawal, avoidance of physical interaction, emotional dependence on online validation, and discomfort in real-life social settings.

These behaviours may increase the likelihood of social anxiety symptoms, particularly among students who use smartphones as a coping mechanism for loneliness, stress, insecurity, or fear of negative social judgment.

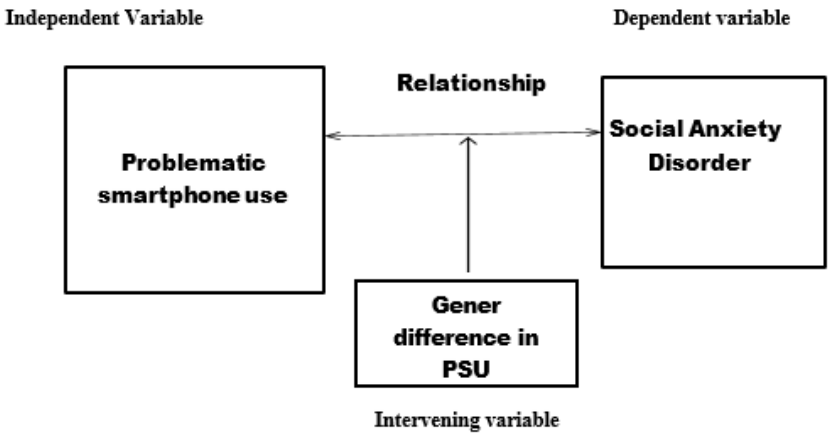
Gender differences in problematic smartphone use are introduced as an intervening variable because the relationship between smartphone use and social anxiety may vary between male and female students. Gender may influence the purpose, frequency, and pattern of smartphone use.

For instance, some students may use smartphones mainly for social networking and emotional interaction, while others may use them for gaming, entertainment, academic activities, or information seeking. These differences may affect how problematic smartphone use develops and how strongly it relates to social anxiety disorder.

The framework is therefore closely connected to the study's objectives, hypotheses, methodology, and analysis. It guides the selection of variables, the development of the research instrument, and the interpretation of the findings. It also provides a logical basis for examining whether problematic smartphone use predicts social anxiety disorder and whether gender differences shape this relationship.

By integrating the framework into the study, the research becomes more coherent because a shared conceptual logic links the literature review, research design, findings, and discussion. Thus, the framework serves as the analytical foundation for understanding how digital behaviour, gendered patterns of smartphone use, and social anxiety are connected among students.

Figue1. Conceptual framework



Source: Authors Construct, 2026.

METHODOLOGY

This study adopted a quantitative cross-sectional descriptive-analytical research design to examine the prevalence and psychological impact of smartphone addiction among students at Kumasi Technical University. The quantitative approach was considered appropriate because the study sought to collect measurable data from a defined student population and analyse patterns, levels of smartphone addiction, and associated psychological outcomes at a specific point in time. The cross-sectional design enabled the researcher to obtain data from respondents within a single period. At the same time, the descriptive-analytical orientation supported both the documentation of smartphone usage behaviours and the examination of relationships between smartphone addiction and psychological indicators.

The descriptive component of the design was used to summarise students' demographic characteristics, smartphone usage patterns, and levels of smartphone addiction. This allowed the study to present a clear profile of how students engage with smartphones in their academic and social lives. The analytical component, on the other hand, was used to examine the psychological implications of smartphone addiction, particularly in relation to indicators such as stress, anxiety, sleep disturbance, emotional instability, and reduced academic concentration. This design was therefore suitable for generating empirical evidence on both the prevalence and psychological consequences of smartphone addiction among university students.

The target population comprised all enrolled students at Kumasi Technical University, estimated at 11,599. To ensure adequate representation across the university, a probability sampling procedure was employed. Specifically, stratified random sampling was used to partition the population by faculty affiliation. After stratification, simple random sampling was used within each faculty to select respondents. This procedure was adopted to reduce sampling bias, improve representativeness, and ensure that students from different academic disciplines were included in the study in proportion to their representation in the population.

A sample size of 333 students was determined using Morgan's sample size table, which is considered appropriate for relatively large populations. The use of this sample size ensured that the study obtained sufficient responses for meaningful statistical analysis while maintaining manageability in data collection. The selection of respondents across faculties strengthened the generalisability of the findings within the context of Kumasi Technical University.

Primary data were collected using a structured self-administered questionnaire. The questionnaire was designed to obtain standardised responses from the selected students and was divided into three main sections. The first section covered demographic characteristics, including age, gender, level of study, and faculty affiliation. The second section focused on smartphone usage behaviour and indicators of smartphone addiction, including frequency of use, duration of use, dependency patterns, and inability to control usage. The third section measured

psychological impact indicators using a five-point Likert scale, ranging from strongly disagree to agree strongly. The use of a structured questionnaire was appropriate because it enabled the collection of comparable, quantifiable data from a relatively large sample.

Before the main data collection exercise, the questionnaire was pilot-tested using 50 students from a different institution who shared similar characteristics with the target respondents but were not part of the main study. The pilot test helped to assess the clarity, wording, structure, and relevance of the questionnaire items. Based on the feedback obtained, necessary revisions were made to improve the instrument before administering it to the final sample. The reliability of the instrument was assessed using Cronbach's alpha, which produced a coefficient of 0.83. This value indicated good internal consistency and confirmed that the questionnaire items were reliable for measuring the constructs under investigation.

Data collected from the questionnaires were coded and analysed using IBM SPSS Statistics version 28.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise respondents' demographic characteristics, smartphone usage patterns, and levels of smartphone addiction. Inferential statistical techniques were also employed to examine the relationship between smartphone addiction and psychological impact indicators. This analytical approach enabled the study to move beyond simple description and assess whether smartphone addiction was statistically associated with students' psychological well-being.

Ethical considerations were strictly observed throughout the research process. Participation in the study was voluntary, and respondents were informed about the purpose of the research before completing the questionnaire. Informed consent was obtained from all participants, and they were assured that their responses would be used only for academic purposes. Confidentiality and anonymity were maintained by ensuring that no personally identifiable information was collected. Respondents also had the right to withdraw from the study at any time without negative consequences. This ensured that the research was conducted in accordance with acceptable ethical standards.

Data Presentation and Analysis

This chapter presents the analysis of data collected from students of Kumasi Technical University (KsTU) using a total of three hundred and thirty-three (333) self-administered questionnaires. The results are presented in tables and figures to support the interpretation of the data. Descriptive statistical analysis was conducted using IBM SPSS Statistics for Scientists, Version 28. The chapter addresses the stated research objectives and outlines the methods used to achieve them. Specifically, the objectives of the study were: (1) to assess the prevalence of smartphone addiction among students at KsTU; (2) to examine the psychological effects of smartphone addiction, with particular attention to symptoms such as anxiety, depression, stress, and sleep quality; and (3) to explore the socio-cultural factors contributing to smartphone addiction among the students.

Gender of the Respondents

Table 1: Gender of the respondents.

Gender	Frequency	Percentages
Male	138	41.4
Female	178	53.5
Prefer not to say	17	5.1
Total	333	100

Source: Fieldwork survey, 2024.

Table 1 shows that 178 (53.5%) of the respondents were female, 138 (41.4%) were male, and 17 (5.1%) were not ready to declare their gender. This implies that most respondents are female. In 2018, females were more

frequent phone users than males; 91% of females were on networks such as Facebook and Instagram, compared with 83% of males (Gummesson, 2022).

TABLE 2: AGES OF THE RESPONDENTS

Ages of the respondents	Frequency	Percentages
Below 18	14	4.2
19-24	232	69.7
25-30	68	20.4
More than 30 years	19	5.7
Total	333	100

Source: Fieldwork survey, 2024

Table 2 shows that 232(69.7%) of the respondents are between the ages of 19 and 24 years, 68(20.4%) of the respondents are between the ages of 25 and 30 years, 19(5.7%) of the respondents are more than 30 years, while only 14(4.2%) of the respondents are below the age of 18 years. This means that the modal class of the respondents are between the ages of 19 and 24 years. This confirmed Marketing Charts' recently released US Media Audience 2019, which found that the age group using smartphones the most is 14-24 years old.

TABLE 3: CURRENT ACADEMIC LEVELS OF THE RESPONDENTS

Current year of the respondents	Frequency	Percentages
Level one	60	18.0
Level two	102	30.6
Level three	91	27.3
Level four	80	24.0
Total	333	100

Source: Fieldwork survey, 2024

Table 3 presents the distribution of respondents by academic level, showing the number of students who participated in the study at each level. The highest number of respondents was from Level Two (30.6%), followed by Level Three (27.3%), Level Four (24.0%), and Level One (18.0%). This distribution provides insights into the representation of students at different academic stages.

The high representation of Level Two students suggests that they are more engaged or accessible for participation in the study. This aligns with research findings indicating that students in their second year tend to be more active in academic surveys due to their transition from foundational courses to more specialised studies (Creswell, 2014). Students in Level Three and Level Four contribute significantly to the study. The slightly lower response rate among Level Four students may be due to their increased academic workload and internship commitments, as suggested by Nuuyoma and Sing (2025) in their study on student persistence and participation in higher education research. The lower participation rate of Level One students may be attributed to their limited exposure to academic research and institutional activities. New students often take time to adjust to university life before actively engaging in surveys. The data suggests an even distribution of respondents across levels, ensuring a comprehensive perspective from students at different stages of their education. The trend aligns with previous studies indicating that middle-year students (Levels Two and Three) are more likely to participate in academic research than first-year and final-year students (Saunders, Lewis, & Thornhill, 2019). Since Level One and Level Four students are underrepresented, the study findings may be slightly skewed towards the experiences of Level Two and Level Three students. Future research should consider strategies to encourage greater participation from first-year and final-year students to ensure a balanced dataset.

The distribution of respondents across different academic levels highlights important trends in survey participation among university students. The highest engagement from Level Two and Three students aligns with existing research on student participation in academic studies. While the findings provide valuable insights, future studies should aim to achieve an even distribution across all levels to ensure comprehensive representation.

Table 4: Analysis of the Faculties of the respondents

Faculties of the respondents	Frequency	Percentages
Applied Sciences and Technology	44	13.2
Built and Natural Environment	60	18.0
Business School	67	20.1
Creative Arts and Technology	67	20.1
Engineering And Technology	31	9.3
Entrepreneurship And Enterprise Development	15	4.5
Health Sciences	17	5.1
IDCE	32	9.6
Total	333	100

Source: Fieldwork survey, 2024

Table 4 show that 44(13.2%) of the respondents were in Applied Sciences and Technology, 60(18.0%) of the respondents were in Built and Natural Environment, 67(20.1%) of the respondents were in Business School, 67(20.1%) of the respondents were in Creative Arts And Technology, 31(9.3%) of the respondents were in Engineering And Technology, 15(4.5%) of the respondents were in Entrepreneurship And Enterprise Development, 17(5.1%) of the respondents were in Health Sciences. Lastly, 32(9.6%) of the respondents were in IDCE. This means that the modal class of respondents in this study was Business School and Creative Arts and Technology.

Analysis of the Gender of the Respondents on the Prevalence and Psychological Impacts of Smartphone Addiction.

This part seeks to analyse the gender of the respondents on the prevalence and psychological impacts of smartphone addiction.

Table 5: Gender of the respondents on prevalence and psychological impacts of smartphone addiction.

Gender	Mean	N (%)	Std. deviation	Rank
Female	1.6629	178(53.4)	0.95010	1st
Male	1.5072	138(41.4)	0.73739	2nd
Prefer not to say	1.3529	17(5.1)	0.78591	3rd
Total	1.5826	333(100)	0.86250	

Source: Fieldwork survey, 2024

Table 5 indicates that female respondents ranked highest in smartphone addiction, with a mean score of M = 1.66, SD = 0.95, followed by male respondents with M = 1.51, SD = 0.74, and lastly, those who preferred not to disclose their gender with M = 1.35, SD = 0.79. This suggests that, in Kumasi Technical University (KsTU), females exhibit higher smartphone addiction levels compared to males.

The higher smartphone addiction among females at KsTU could be attributed to several factors. First, females are more likely to use their phones to share personal experiences with friends and family. Additionally, they may rely on their phones as a form of distraction, whereas males are often engaged in other activities that limit excessive phone use.

These findings align with previous research, emphasising that smartphone addiction among females is influenced by social and psychological factors, including the need for social connectivity and emotional expression.

Analysis of the age of the respondents on the prevalence and psychological impacts of smartphone addiction.

This section seeks to analyse the ages of the respondents on the prevalence and psychological impacts of smartphone addiction.

Table 6: **Age of the respondents**

Age of the respondents	Mean	N	Std. deviation	Rank
19-24 years	1.6207	232	0.81814	1st
Below 18 years	2.7143	14	1.72888	2nd
25-30	1.3824	68	0.62365	3rd
More than 30 years	1.0000	19	0.0000	4th
Total	1.5826	333	0.86250	

Source: Fieldwork survey, 2024

Table 6shows that the Below 18-year group has a mean of 2.7143, the highest among the age categories, suggesting that, on average, respondents in this group tend to provide higher scores or responses to the question or variable being measured. The standard deviation of 1.72888 indicates a relatively large spread or variation in responses, suggesting that responses within this age group are quite diverse. 19-24 years: This group has a mean of 1.6207, which is lower than the group below 18, but still notable. The standard deviation of 0.81814 is also relatively low, indicating that responses are more consistent within this group compared to others. The ranking of 1st implies that this age group is considered most central or relevant in this context, perhaps in terms of frequency or significance to the analysis. 25-30 years: With a mean of 1.3824, this group's responses are on the lower end of the scale. The standard deviation of 0.62365 is the lowest among the groups, suggesting that responses from this age group are highly consistent, with little variation among respondents. This could indicate a more uniform perspective or experience regarding the measured variable. More than 30 years: This age group has the lowest mean of 1.0000, and, notably, the standard deviation is 0.0000, indicating no variation in responses within this group. Every respondent in this category gave the same response, suggesting a unanimous or highly consistent perspective. Despite the consistency, this group ranks last (4th), suggesting their responses might be less impactful or less frequent than those of other groups.

The rank assigned to each age group can reflect its relevance or importance within the survey or study, relative to the subject matter. The group aged 19-24 ranks highest (1st), indicating they might be central to the research focus, either because of their larger sample size or because their responses carry greater weight. Those below 18 years rank second (2nd), with the highest mean, which could reflect that younger individuals may be more enthusiastic, passionate, or reactive to the subject matter in question. However, their responses are more varied (higher standard deviation), meaning they don't have a consistent viewpoint. 25-30 years ranks third (3rd), with the lowest variation in responses, indicating that although their opinions are consistent, they may be more reserved or moderate. More than 30 years ranks last (4th), with the lowest mean and no variation. The lack of variation might suggest that this group has very firm, unambiguous opinions. Still, it could also indicate lower engagement or interest in the topic than among younger age groups. Age and Engagement: The higher mean among respondents under 18 and the relatively lower mean among older age groups (particularly those over 30) may indicate different levels of engagement, interest, or experience with the subject matter. Younger individuals

might have more dynamic, varied responses due to their developing perspectives, while older individuals might have more fixed opinions or be less engaged. Understanding these differences can help target the right audience for a given research project, product, or service. For example, the 19-24 years age group, ranking first, could be of primary interest for certain marketing strategies or research, given that their responses are both frequent and fairly consistent. The standard deviation figures highlight the consistency or divergence within each age group. A lower standard deviation (as in the 25-30 years group) implies a consensus or shared opinion. In comparison, a higher standard deviation (as in the Below 18 years group) suggests a more heterogeneous set of responses. In conclusion, the data reflect different patterns of engagement, opinion consistency, and variability across age groups. The 19-24-year-old group stands out for consistency, while younger and older groups show either greater variation or lower engagement. Understanding these nuances is important for interpreting how age influences responses, and the data could be applied to tailor strategies or further research efforts according to the preferences and characteristics of different age demographics.

Research conducted by the Pew Research Centre (2005) on internet-based interactions found that only 5% of American adults used social media at the time. However, by 2011, this figure had risen to 50%, and as of recent years, 72% of adults actively use some form of online platform. Furthermore, the demographic composition of social media users has expanded, with younger individuals continuing to dominate usage rates. At the same time, older age groups have shown increasing engagement over time.

The prevalence of smartphone addiction among individuals in the 19-24 years age group can be attributed to the rapid expansion of digital technology, the accessibility of online entertainment, and the increased use of smartphones for social interaction and academic purposes. Given these trends, the study supports the assertion that younger individuals, particularly those in the 19-24 year group, exhibit significantly higher smartphone dependence than older age groups.

Analysis of the ethnicity of the respondents on the addiction to smartphones and their academic performances.

Table 7: Correlation between Respondents' Ethnicity, Smartphone Use Duration and Academic Performance

Variables	Ethnicity	GPA	Hours spent on a smartphone daily
Ethnicity	1		
GPA	-0.072	1	
Hours spent on a smartphone daily	0.091	-0.390**	1
N	333	333	333

Note: Correlation is significant at the 0.01 level, 2-tailed.

Source: Fieldwork survey, 2024.

Table 7 presents the Pearson correlation analysis examining the relationships among respondents' ethnicity, daily smartphone use duration, and academic performance, measured by GPA. The analysis was based on responses from 333 participants. The correlation results indicate that ethnicity was weakly negatively associated with GPA, with a correlation coefficient of **r = -0.072**. However, this relationship was not statistically significant at the 0.05 level, as the p-value was **0.191**. This implies that ethnicity was not statistically significantly associated with students' academic performance in the study.

The results also show a weak positive relationship between ethnicity and the number of hours spent on smartphones daily, with a correlation coefficient of **r = 0.091**. However, this relationship was also not statistically significant, as the p-value was **0.098**, which is greater than 0.05. This indicates that respondents' ethnicity did not significantly determine the amount of time spent using smartphones daily.

However, the relationship between daily smartphone use and academic performance was negative and statistically significant. The results showed a correlation coefficient of **r = -0.390** with a significance value of **p = 0.000**. This indicates a moderate negative relationship between the number of hours students spend on smartphones daily and their GPA. In other words, as daily smartphone use increases, academic performance tends to decrease. Therefore, the negative correlation coefficient should be interpreted as an inverse relationship rather than a positive association.

Overall, the findings suggest that ethnicity was not significantly associated with either GPA or daily smartphone use. However, daily smartphone use was associated with a statistically significant negative relationship with GPA.

This means that higher smartphone use duration is associated with lower academic performance among the respondents. This finding is important because it highlights the need for students to regulate their excessive smartphone use to reduce its potential negative effects on academic outcomes.

Determination of the Level of Prevalence of Smartphone Addiction Among KSTU Students.

Several scholars identified social networking sites; the listed channels were varied, but the researcher restricted the analysis to the following networks: Imo, Google Plus, Flickr, LinkedIn, YouTube, Twitter, Snapchat, Instagram, WhatsApp, and Facebook (Jones, 2005; Ijaiya, 2000).

Responses were measured and evaluated to arrive at the utilisation rate in each classroom. The scores of Least Commonly used, Commonly Used and Most Commonly Used are attained during the original calculation under which the continuous variable was collected. The group with the most responses has been regarded as the university's most influential.

Table 8: Smartphone Usage and Addiction Behaviour

Statements	Low-level addiction	Addiction	High-level addiction	Rank
	Frequency (%)	**Frequency (%)**	**Frequency (%)**	
I feel anxious if I am separated from my smartphone.	255(76.6)	61(8.3)	17(5.1)	1st
I check my phone frequently during social gatherings, meals, or family time.	118(35.4)	121(36.3)	94(28.2)	2nd
I feel irritated or upset if I cannot access my smartphone for a few hours.	114(34.2)	106(31.9)	113(33.8)	3rd
I often use my phone to escape negative feelings.	98(29.4)	82(24.6)	153(45.9)	4th
I unlock my phone more than 30 times a day.	87(25.1)	85(25.5)	161(48.3)	5th
I feel the urge to use my phone even when I am not expecting any messages.	82(24.0)	65(19.5)	186(55.9)	6th
My primary activity on my smartphone is social media.	52(15.6)	75(22.5)	206(61.9)	7th

I often lose track of time when using my smartphone.	17(5.1)	42(12.6)	274(82.3)	8th
I feel the need to respond to messages immediately.	16(4.8)	41(12.3)	278(82.9)	9th
I use my smartphone for more than 4 hours a day.				10th

Source: Fieldwork survey, 2024

Table 9: Descriptive statistics of the Smartphone Usage and Addiction Behavior used in this study.

	Mean	**Std. Deviation**	**N**
I feel anxious if I am separated from my smartphone.	3.2546	.69063	333
I check my phone frequently during social gatherings, meals, or family time.	2.7147	.55400	333
I feel irritated or upset if I cannot access my smartphone for a few hours.	2.0030	.82688	333
I often use my phone to escape negative feelings.	1.7778	.84226	333
I unlock my phone more than 30 times a day.	1.5375	.75006	333
I feel the urge to use my phone even when I am not expecting any messages.	2.0721	.79583	333
My primary activity on my smartphone is social media.	1.2282	.52828	333
I often lose track of time when using my smartphone.	1.2192	.51775	333
I feel the need to respond to messages immediately.	1.8348	.85362	333
I use my smartphone for more than 4 hours a day.	1.2523	.52300	333

Source: Fieldwork survey, 2024

Being measured on a three-point Likert scale (High level addiction =1, Addiction =2, and Low-level addiction =3), the mean score indicated the choice for I feel anxious if I am separated from my smartphone (2.55) against all other levels of addiction used in the study.

Table 8 presents the results of the prevalence of smartphone addiction among KsTU students. *I feel anxious if I am separated from my smartphone* was ranked first with 255(76.6%) of the respondents which indicated that they are highly addicted, *I check my phone frequently during social gatherings, meals, or family time* was ranked second with 118(35.4%) indicating respondents are highly addicted, *I feel irritated or upset if I cannot access my smartphone for a few hours* was ranked third with 114(34.2%) of the respondents indicating that they are highly addicted. *I often use my phone to escape negative feelings* was fourth with 98(29.4%) showing respondents are highly addicted, *I unlock my phone more than 30 times a day* was ranked fifth with 87(25.1%) depicting respondents are highly addicted, *I feel the urge to use my phone even when I am not expecting any messages* was ranked sixth with 82(24%) of the respondents showing they are highly addicted, *My primary activity on my smartphone is social media* was ranked seventh with 52(15.6%) of the respondents indicating they are highly addicted, *I often lose track of time when using my smartphone* was ranked eighth with 17(5.1%) of the respondents used, *I feel the need to respond to messages immediately* was ranked ninth with 16(4.8%) of the respondents indicating they are highly addicted. Lastly, *I use my smartphone for more than 4 hours a day; most were ranked tenth, with 14* (4.2%) of the respondents indicating they are highly addicted.

Table 10: Analysis of how many hours the students of KsTU spend studying per week.

Number of Hours	Frequency	Percentage
1-5	178	53.5
6-10	71	21.3
More than 10 hours	84	25.2
Total	333	100

Source: Fieldwork survey, 2024.

Table 10 indicates that 178(53.3%) of respondents suggested that they spent one to five hours studying each week, and again 71(21.3%) stated that they spent six to ten hours studying each week, while 84(25.2%) suggested that they spent more than ten hours studying each week. From Table 4.2.2, it can be concluded that Kumasi Technical University students spent between 1 and 6 hours per week studying. Social information processing theory is an interpersonal communication theory that suggests that online interpersonal relationships might require more time to develop than face-to-face relationships. Still, once developed, it has the same influence as face-to-face communication. Social information processing theory is applied to the study of when a student posts an image on a phone: the student normally goes back to check the number of likes the image or video has received. The students' attention will be on likes during the lecture, which might affect their academic performance.

Table 11: Analysis of how many hours the students of KsTU spend on smartphones daily.

Number of Hours	Frequency	Percentage
1-5	210	63.1
6-10	60	18.0
More than 10 hours	63	18.9
Total	333	100

Source: Fieldwork survey, 2024

Table 11 indicates that 210(63.1%) of respondents reported that they spend one to five hours on a smartphone every day, 60(18.0%) of respondents mentioned that they spend six to ten hours on a smartphone every day, and 63(18.9%) of respondents reported that they spend more than ten hours on a smartphone per day. With the table review, it can be concluded that KsTU students invest between one and five hours on average daily on their smartphones.

Psychological Impacts of Smartphone Addiction on These Students, Focusing on Aspects/Symptoms Such as Anxiety, Depression, Stress and Sleep Quality.

As has been asserted by numerous authors, there is an established association between the level of smartphone addiction in these students, focusing on aspects/symptoms such as anxiety, depression, stress and sleep quality. This study sought to affirm such educational conjecture using data from the University. To assess such an association, this study adapted the Smartphone Addiction Questionnaire. The Psychological impacts of smartphone addiction on these students, focusing on aspects/symptoms such as anxiety, depression, stress and sleep quality were*: I feel anxious when I cannot access my smartphone*, *I check my phone to calm myself when feeling stressed or anxious*, *I often use my smartphone to distract myself from socially anxious situations*, *I feel low or depressed after prolonged smartphone use*, *I have withdrawn from social and physical activities due to excessive smartphone use*, *I feel emotionally dependent on my smartphone to feel happy or engaged, I feel overwhelmed by the number of notifications I receive*, *I feel stressed when my phone malfunctions or runs out of battery, I frequently use my smartphone just before falling asleep, My smartphone use has negatively affected my sleep patterns and lastly I often experience daytime drowsiness due to late-night smartphone use*. These

constructs were measured using a five-point Likert scale (strongly agree, agree, neutral, disagree and strongly disagree). After this, a composite index was generated to represent students' academic performance. This index was expressed in percentage terms.

Table 12: Correlation between the GPA of the students and the time they spend on the phone daily.

		GPA	How many hours do students spend on the phone daily?
Pearson correlation	GPA How many hours do students spend on their phones daily?	1.000 -.390	-.390 1.000
	GPA How many hours do students spend on their phones daily?	.0000	.000
	GPA How many hours do students spend on phones daily?	333 333	333 333

Correlation is significant at the 0.05 level

Source: Fieldwork survey, 2024

The model generally fit well, as it explained the variation in students' GPAs and the hours they spend on the phone daily, as indicated in Table 12 above. The correlation reported in Table 12 below further corroborates the model's fitness. The significance values for the respective independent variables were all below the standard 0.05 level. Specifically, the table above shows that students' GPA and the time they spend on the phone daily are negatively correlated at -.390.

Correlation analysis of smartphone addiction and the anxiety level of students

Using Pearson's correlation, the smartphone addiction and anxiety levels of students' scores for the KsTU students involved in this study yielded an r-value of .032, with a significance level set at $p < 0.05$. The null hypothesis was that the smartphone addiction calculation and the anxiety level of students' scores are not related. The null hypothesis can be rejected, indicating a statistically significant correlation, as illustrated in Table 13.

Table 13: Correlational and descriptive statistics for smartphone addiction and anxiety level of students

		Smartphone Addiction	**Anxiety level of students**	**Mean**	**STD**
Smartphone Addiction	Pearson correlation Sig. (2-tiled) N	1 333	-.032 .560 333	3.2546	.69063
Anxiety level of students	Pearson correlation Sig. (2-tiled) N	-.032 .560 333	1 333	2.9910	1.25987

**correlation is significant at the 0.05 level (2-tailed)

Source: Field survey, 2024

To review the correlation of smartphone addiction and anxiety level of students in these 333 students in KsTU, the researcher created specific parameters to correlate the data. The first parameter was the geographic setting.

Both variables, smartphone addiction calculation and anxiety level of students for KsTU, were compared to determine significance at a level of $p<0.05$, using Pearson's correlation analysis. The r-value for the students of KsTU was calculated at -0.032, with a significance level of $p < 0.05$. This statistic shows that the null hypothesis – smartphone addiction and anxiety level of students in KsTU fails to be accepted. The relationship between smartphone addiction and the anxiety level of students in KsTU shows a positive correlation, which is statistically significant.

Correlation analysis of smartphone addiction and the depression level of students

Using Pearson's correlation, the smartphone addiction and depression level of students' scores for the students of KsTU involved in this study, calculated an r-value of .097 with a significance level set at $p<0.05$. The null hypothesis was that smartphone addiction and the depression levels of students' scores are not related. The null hypothesis can be rejected, indicating a statistically significant correlation, as illustrated in Table 14.

Table 14: Correlational and descriptive statistics for Smartphone Addiction and the depression level of students

		Smartphone Addiction	**Depression level of students**	Mean	STD
Smartphone Addiction	Pearson correlation Sig. (2-tiled) N	1 333	.097 .078 333	3.2546	.69063
Depression level of students	Pearson correlation Sig. (2-tiled) N	-.097 .078 333	1 333	2.4084	1.18786

**correlation is significant at the 0.05 level (2-tailed)

Source: Field survey, 2024

To review the correlation of Smartphone Addiction and the depression level of students in these 333 students in KsTU, the researcher created specific parameters to correlate the data. The first parameter was the geographic setting.

Both variables, Smartphone Addiction and students' depression levels at KsTU, were compared to determine significance at p <, again using Pearson's correlation analysis. The r-value for the students of KsTU was calculated at -0.097, with a significance level of $p < 0.05$.

This statistic shows that the null hypothesis – Smartphone Addiction and depression level of students in KsTU fails to be accepted. The relationship between Smartphone Addiction and the depression levels of students in KsTU shows a positive correlation, which is statistically significant.

Correlation analysis of Smartphone Addiction and stress levels of students

Using Pearson's correlation, the Smartphone Addiction and Stress level scores for students of KsTU involved in this study yielded an r-value of .203, with a significance level set at $p < 0.05$. The null hypothesis was that the Smartphone Addiction and stress levels of students' scores are not related. The null hypothesis can be rejected, indicating a statistically significant correlation, as illustrated in Table 15.

Table 15: Correlational and descriptive statistics for Smartphone Addiction and stress levels of students.

		Smartphone Addiction	Stress level of students.	Mean	STD
Smartphone Addiction	Pearson correlation Sig. (2-tiled) N	1 333	-.203 .000 333	3.2546	.69063
Stress level of students	Pearson correlation Sig. (2-tiled) N	-.203 .000 333	1 333	3.1381	1.33719

correlation is significant at the 0.05 level (2-tailed). **Source:** Field survey, 2024

To review the correlation between Smartphone Addiction and Stress level among 333 students at KsTU, the researcher created specific parameters to analyse the data. The first parameter was the geographic setting.

Both variables, Smartphone Addiction and students' stress levels at KsTU, were compared to determine significance at $p < 0.05$, again using Pearson's correlation analysis. The r-value for the students of KsTU was calculated at -0.203, with a significance level of $p < 0.05$. This statistic shows that the null hypothesis – Smartphone Addiction and Stress level of students in KsTU fails to be accepted. The relationship between student Smartphone Addiction and the stress levels of students in KsTU shows a positive correlation, which is statistically significant.

Correlation analysis of Smartphone Addiction and stress levels of students.

Using Pearson's correlation, the smartphone addiction and stress levels of students at KsTU involved in this study were calculated, yielding an r-value of .119 with a significance level set at $p < 0.05$. The null hypothesis was that the Smartphone Addiction and stress levels of students' scores are not related. The null hypothesis can be rejected, indicating a statistically significant correlation, as illustrated in Table 16.

Table 16: Correlational and descriptive statistics for Smartphone Addiction and stress levels of students.

		Smartphone Addiction	Stress level of students	Mean	STD
Smartphone Addiction	Pearson correlation Sig. (2-tiled) N	1 333	-.119 .000 333	3.2546	.69063
Stress level of students	Pearson correlation Sig. (2-tiled) N	-.119 .000 333	1 333	3.1381	1.33719

Source: Field survey, 2024

To review the correlation between Smartphone Addiction and Stress level among 333 students at KsTU, the researcher created specific parameters to analyse the data. The first parameter was the geographic setting.

Both variables, Smartphone Addiction and students' stress levels at KsTU, were compared to determine significance at $p <$, again using Pearson's correlation analysis. The r-value for the students of KsTU was calculated at -0.119, with a significance level of $p < 0.05$. This statistic shows that the null hypothesis – Smartphone Addiction and Stress level of students in KsTU fails to be accepted. The relationship between

Smartphone Addiction and the stress levels of students in KsTU shows a positive correlation, which is statistically significant.

Correlational analysis of Smartphone Addiction and sleep quality among students.

Using Pearson's correlation, the smartphone addiction and sleep quality scores for the students of KsTU involved in this study yielded an r-value of .042, with a significance level set at $p < 0.05$. The null hypothesis was that smartphone addiction and sleep quality score are not related. The null hypothesis can be rejected, indicating a statistically significant correlation, as illustrated in Table 17.

Table 17: Correlational and descriptive statistics for smartphone addiction and sleep quality of students in KSTU.

		Smartphone Addiction	Sleep quality of students	Mean	STD
Smartphone Addiction	Pearson correlation Sig. (2-tiled) N	1 333	-.042 .44 333	3.2546	.69063
Sleep quality of students	Pearson correlation Sig. (2-tiled) N	-.042 .44 333	1 333	2.4865	1.22375

Source: Field survey, 2024

To review the correlation between smartphone addiction and sleep quality among 333 students at KsTU, the researcher created specific parameters to correlate the data. The first parameter was the geographic setting.

Both variables, smartphone addiction and sleep quality of students for KsTU, were compared to determine significance at a level of $p<0.05$, using Pearson's correlation analysis. The r-value for the students of KsTU was calculated as .042, with a significance level of $p < 0.05$. This statistic shows that the null hypothesis – smartphone addiction and sleep quality of students in KsTU fails to be accepted. The relationship between smartphone addiction and the sleep quality of students in KsTU shows a negative correlation, which is statistically significant.

Correlation analysis of smartphone addiction and sleep quality of students in KsTU

Using Pearson's correlation, the smartphone addiction and sleep quality scores for students of KsTU involved in this study yielded an r-value of .191, with a significance level set at $p < 0.05$. The null hypothesis was that students' smartphone addiction and sleep quality scores are not related. The null hypothesis can be rejected, indicating a statistically significant correlation, as illustrated in Table 18.

Table 18: Correlational and descriptive statistics for Smartphone Addiction and sleep quality of students

		Smartphone Addiction	Sleep Quality of Students .	Mean	STD
Smartphone Addiction	Pearson correlation Sig. (2-tiled) N	1 333	.191 .000 333	3.2546	.69063
Sleep Quality of Students	Pearson correlation Sig. (2-tiled) N	.191 .000 333	1 333	2.4865	1.22375

Source: Field survey, 2024

To review the correlation between smartphone addiction and sleep quality among 333 students at KsTU, the researcher created specific parameters to correlate the data. The first parameter was the geographic setting.

Both variables, smartphone addiction and sleep quality of students for KsTU, were compared to determine significance at a level of $p<0.05$, using Pearson's correlation analysis. The r-value for the students of KsTU was calculated at 0.191, with a significance level of $p < 0.05$.

This statistic shows that the null hypothesis – smartphone addiction and sleep quality of students in KsTU fails to be accepted. The relationship between smartphone addiction and the sleep quality of students in KsTU shows a negative correlation, which is statistically significant.

Table 19: Anova[a] for Smartphone addiction in these students, focusing on aspects/symptoms such as anxiety, depression, stress and sleep quality of Kstu Students.

Model	Sum of squares	Df	Mean Square	.F	Sig.
Regression	24.084	1	24.084	59.373	.000[b]
Residual	134.268	331	.406		
Total	158.353	332			

Source: Fieldwork survey, 2024

a. Dependent variable: Depression
b. Predictors: (constant), How many hours do you spend on your smartphone daily?

Table 20: Residuals statistics [for] Smartphone addiction in these students, focusing on aspects/symptoms such as anxiety, depression, stress and sleep quality of Kstu Students.

	Minimum	**Maximum**	**Mean**	**Std. Deviation**	**N**
P-Value	2.1874	3.4365	3.2546	.26934	333
Residual	-2.52194	1.54351	.00000	.63594	333
Std. Predicted Value	-3.962	.675	.000	1.000	333
Std. Residual	-3.960	2.423	.000	.998	333

Dependent Variable: Anxiety

Source: Fieldwork survey, 2024

The Socio- Cultural Factors Contributing to Smartphone Addiction in KSTU Students. Activities for Objective Three Were Conducted as Part of the Study.

Table 21 shows the activities taken for objective three. The table shows 1-Strongly Agree, 2-Agree, 3-Disagree and 4-Strongly Disagree.

Table 21: Descriptive statistics on the socio- cultural factors contributing to smartphone addiction in KsTU students.

Statement	1	2	3	4		Descriptive Statistics			
	F	**F**	**F**	**F**	**Total**	**Mean**	**Mode**	**STD D**	**Rank**
My peers influence my smartphone usage habits.	42	125	92	73	333	2.59	1.00	.967	1st
Social media culture (e.g., trends, challenges, influencer culture) impacts my smartphone usage.	67	97	110	60	333	2.49	1.00	1.01	2nd
I feel pressured to stay constantly online or up to date due to peer or societal expectations.	61	97	126	49	333	2.49	1.00	.96	3rd
I feel left out if I do not check social media or online messages regularly.	114	104	63	52	333	2.15	1.00	1.07	4th
The culture in Ghana encourages high smartphone usage.	131	107	75	20	333	1.95	1.00	.927	5th
I use my smartphone frequently to fit into social norms.	167	97	49	20	333	1.77	1.00	.915	6th

Source: Fieldwork survey, 2024

This section seeks to analyse the socio-cultural factors contributing to smartphone addiction among KsTU students. The respondents indicated that *My peers influence my smartphone usage habits* was ranked first with *(M- 2.59: SD- .967)*, the respondents confirmed that *Social media culture (e.g., trends, challenges, influencer culture) impacts my smartphone usage* was ranked second with *(M- 2.49: SD- 1.01)*, the respondents also affirm that *I feel pressured to stay constantly online or updated due to peer or societal expectations* was ranked third with *(M- 2.49: SD- .96)*,

The respondents again confirmed that *I feel left out if I do not check social media or online messages regularly* was ranked fourth with *(M- 2.15: SD- .1.07)*, the respondents affirm that *The culture in Ghana encourages high smartphone usage* was ranked fifth with a *(M- 1.95: SD- .927)* and lastly *I use my smartphone frequently to fit into social norms* was sixth with *(M-1.77: SD- .924)*.

Study Implications for Policy, Practice and Research

The findings reveal a notable prevalence of smartphone addiction among KsTU students, with significant associations with anxiety, depression, stress, sleep disturbance, and declining academic performance. This highlights the urgent need for institutional and national-level digital well-being policies. University management should develop clear guidelines regulating smartphone use in lecture halls, libraries, and examination environments. The Ghana Tertiary Education Commission and Ministry of Education should integrate digital wellness modules into student orientation programs and curricula. Policies should also support the establishment of campus-based mental health units that specifically address technology-related behavioural risks, rather than treating them as general stress issues.

For practice, university counselling centres must adopt targeted interventions, such as smartphone-use screening, digital detox programs, and time-management workshops. Peer-led digital wellness campaigns can be

introduced, given the strong influence of peer norms and social media culture on usage patterns. Lecturers can embed structured smartphone-based learning activities to redirect excessive use into academic productivity. Parents and guardians should be sensitised through institutional outreach programs to monitor students' excessive use and sleep patterns. Mobile app developers and telecom companies could collaborate with universities to design usage-monitoring tools that provide real-time feedback on screen time, sleep interference, and emotional dependency.

This study contributes Ghana-specific empirical evidence to the global literature on smartphone addiction and psychological well-being. However, future research should adopt longitudinal designs to establish causal relationships between smartphone addiction and mental health outcomes. Experimental and intervention-based studies are needed to evaluate the effectiveness of digital wellness programs. Further work should explore disciplinary differences, personality traits, and socioeconomic moderators. Qualitative approaches could also provide deeper insights into students' lived experiences, coping strategies, and cultural interpretations of smartphone dependency.

Overall, these implications underscore that smartphone addiction is not merely a personal habit but a structural challenge that requires coordinated policy reform, institutional action, and sustained scholarly inquiry.

CONCLUSION

This study examined the prevalence and psychological impact of smartphone addiction among students at Kumasi Technical University, with particular focus on anxiety, depression, stress, sleep quality, and socio-cultural drivers. The findings indicate that problematic smartphone use is widespread among students and is significantly associated with adverse psychological outcomes and reduced academic performance. Peer influence, social media culture, and societal expectations emerged as key socio-cultural factors reinforcing excessive smartphone engagement. These results confirm that smartphone addiction is not merely a technological issue, but a complex psychosocial phenomenon shaped by emotional vulnerability, cultural norms, and academic pressures.

Based on these findings, several recommendations are proposed. First, university management should establish digital well-being policies that regulate smartphone use during academic activities while promoting responsible engagement. Second, counselling units should implement structured screening, psychoeducation, and behavioural intervention programs focused on digital dependency. Third, lecturers should integrate guided smartphone-based learning strategies to minimise distractions and enhance academic utility. Finally, student orientation programs should include modules on self-regulation, time management, and healthy technology habits. Future studies should employ longitudinal and experimental designs to establish causal relationships and assess the effectiveness of digital wellness interventions.

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