

Impact of Socio-Economic Factors on ICT Adoption in Basic Schools in Wa Municipality

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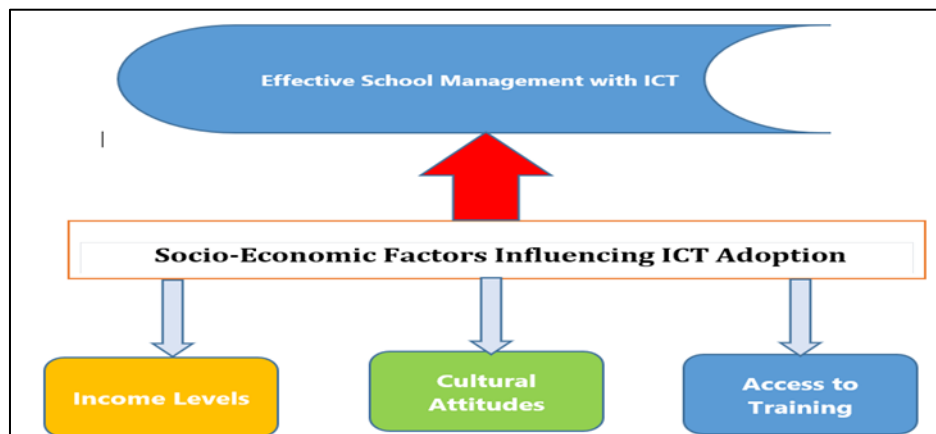
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Abstract

The integration of Information and Communication Technology (ICT) into the management of basic schools is increasingly acknowledged as an essential facet of contemporary educational leadership. This study explores the influence of socio-economic factors on the adoption of ICT tools by headteachers in basic schools within the Wa Municipality, Ghana. Employing a mixed-methods approach, the research amalgamates quantitative data from 200 headteachers with qualitative perspectives derived from 20 key informant interviews. The findings indicate that income levels, access to training, and cultural attitudes profoundly affect the assimilation of ICT tools in school management. Although there exists a general inclination among headteachers to embrace ICT, structural and systemic impediments hinder its effective implementation. The study culminates with recommendations for policy interventions aimed at bridging the digital divide and fostering equitable ICT integration in basic school management. These interventions encompass targeted financial assistance, structured professional development programs, community engagement initiatives, and policy reforms designed to enhance ICT infrastructure in rural locales. By addressing these socio-economic barriers, stakeholders can cultivate a more inclusive and effective environment for digital transformation in education, ultimately contributing to enhanced teaching, learning, and governance outcomes at the basic school level.



A flowchart that visually traces the relationship between socio-economic factors and ICT adoption in school management.

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1. Introduction

In the contemporary educational landscape, the integration of Information and Communication Technology (ICT) into school management is increasingly recognized as a critical component of modern educational leadership [1]. ICT tools offer a broad range of applications that can enhance administrative efficiency, improve educational outcomes, and foster digital literacy among students and educators [2]. However, the adoption of ICT tools by headteachers in basic schools is often hindered by a variety of socio-economic factors, including income levels, access to training, and cultural attitudes [3]. These factors can significantly influence the extent to which ICT tools are integrated into daily school management practices.

Ghana, like many developing countries, has made significant strides in promoting ICT in education through various policy initiatives and investments [4]. However, the digital divide between urban and rural schools remains a significant challenge, with rural schools often lacking essential ICT infrastructure [5]. This disparity is exacerbated by socio-economic factors such as low income levels, limited access to training, and cultural resistance to digital transformation [6]. Understanding these factors is crucial for developing targeted interventions that can bridge the digital divide and promote equitable ICT integration in basic schools.

This study aims to investigate the impact of socio-economic factors on the adoption of ICT tools by headteachers in basic schools in the Wa Municipality, Ghana. By examining income levels, access to training, and cultural attitudes, this study seeks to provide empirical evidence that can inform policy decisions and practical interventions aimed at enhancing ICT integration in basic school management. The findings of this study are expected to contribute to the broader understanding of the challenges and opportunities associated with ICT adoption in educational settings, particularly in resource-constrained environments.

2. Literature Review

The integration of Information and Communication Technology (ICT) into basic school management has been widely recognized as a transformative tool for enhancing educational outcomes and administrative efficiency [1]. ICT tools offer a range of applications that can streamline administrative tasks, improve communication, and support data-driven decision-making [2]. However, the adoption of these tools by headteachers in basic schools is influenced by a variety of socio-economic factors, including income levels, access to training, and cultural attitudes [3].

2.1. Socio-Economic Factors and ICT Adoption

Income levels play a significant role in determining the extent to which headteachers can invest in ICT tools. Financial constraints often limit the ability of headteachers to purchase personal computing devices or maintain consistent internet access, which are essential for regular engagement with digital platforms [4]. This is particularly pronounced in rural areas where headteachers may earn lower salaries and face additional costs related to infrastructure and connectivity [5].

Access to training is another critical factor influencing ICT adoption. Studies have shown that formal training programs significantly enhance the confidence and competence of headteachers in using ICT tools [6]. However, many headteachers, especially those in rural areas, lack access to structured professional development opportunities. This gap in training can lead to a reluctance to use unfamiliar tools, fear of damaging equipment, and overall lower ICT proficiency [7].

Cultural attitudes and community expectations also play a significant role in shaping the adoption of ICT tools. In some rural communities, there is a preference for traditional, paper-based methods over digital alternatives. This resistance can stem from a lack of awareness of the benefits of ICT, skepticism about its effectiveness, or a general resistance to change [8]. Community support and positive attitudes towards digital transformation are crucial for successful ICT integration in schools.

2.2. Urban-Rural Divide

The digital divide between urban and rural schools is a significant barrier to ICT adoption. Urban schools generally have better access to ICT infrastructure, including stable electricity, internet connectivity, and technical support [9]. In contrast, rural schools often face significant challenges, including erratic electricity supply, poor internet access, and

limited training opportunities [10]. This disparity is exacerbated by socio-economic factors, with rural schools often receiving fewer resources and less attention from government initiatives [11].

2.3. ICT Usage Patterns

ICT tools are primarily used for communication tasks, such as messaging and email correspondence, which are perceived as more accessible and less complex [12]. More advanced administrative tasks, such as digital record-keeping and financial reporting, are less frequently adopted. This pattern suggests that while there is a willingness among headteachers to integrate ICT, structural and systemic barriers limit the extent of its application [13].

2.4. Conclusion

The literature highlights the multifaceted challenges associated with ICT adoption in basic schools. Socio-economic factors, including income levels, access to training, and cultural attitudes, significantly influence the integration of ICT tools in school management. Addressing these challenges requires targeted interventions that focus on improving access to ICT infrastructure, providing structured professional development programs, and fostering community support for digital transformation. By addressing these socio-economic barriers, stakeholders can promote more equitable and effective ICT integration in basic schools.

3. Methods and Materials

This study employed a mixed-methods research design to comprehensively investigate the impact of socio-economic factors on the adoption of Information and Communication Technology (ICT) tools by headteachers in basic schools in the Wa Municipality, Ghana. The mixed-methods approach was chosen to provide a balanced and nuanced understanding of the research problem, combining quantitative data for statistical analysis with qualitative insights for in-depth contextual understanding [12].

The study was conducted in the Wa Municipality, located in the Upper West Region of Ghana. The Wa Municipality was selected due to its diverse socio-economic and infrastructural contexts, which include both urban and rural basic schools. The target population consisted of all basic school headteachers in the municipality, with a total of 250 headteachers identified through records from the Wa Municipal Directorate of Education [14].

A total of 200 headteachers were selected using a mixed sampling strategy that combined cluster and systematic sampling techniques. The municipality was divided into ten clusters based on geographical distribution and administrative convenience. Five clusters were randomly selected using simple random sampling methods. Within each selected cluster, schools were grouped, and headteachers were chosen systematically to ensure even coverage [16]. The final sample consisted of 200 headteachers, with 40 respondents selected from each of the five clusters.

Quantitative data were collected using a semi-structured questionnaire designed to gather information on headteachers' demographic characteristics, access to ICT infrastructure, socio-economic barriers, and ICT usage patterns. The questionnaire included both Likert-scale items and open-ended questions to capture both numerical data and qualitative insights [17].

In addition to the questionnaire, qualitative data were gathered through in-depth interviews with 20 key informants, including headteachers and education officers. The interviews were guided by an interview schedule containing open-ended questions to explore systemic barriers to ICT adoption, policy frameworks, and institutional support [18].

Quantitative data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics such as frequencies, percentages, means, and standard deviations were employed to summarize respondents' demographic characteristics and ICT usage patterns. Regression analysis was used to explore relationships between socio-economic factors and ICT adoption [19]. The statistical software SPSS Version 28 was utilized for all quantitative analyses.

Qualitative data were analyzed thematically. The interview transcripts and open-ended questionnaire responses were coded into categories and themes to identify recurring patterns and insights. Software tools such as NVivo and Microsoft Word were used to facilitate coding and theme identification, enhancing the rigor and reliability of the findings [20].

To ensure the quality and credibility of the data, validity and reliability measures were carefully implemented. Content validity was established through expert review, with the questionnaire reviewed by academic supervisors and an expert in educational technology. Construct validity was ensured by aligning the questionnaire items with the Unified Theory

of Acceptance and Use of Technology (UTAUT) model. Face validity was achieved through a pilot test with a small group of headteachers. Criterion-related validity was supported through triangulation of data sources [21].

Reliability was assessed using test-retest reliability, internal consistency, and inter-coder reliability. A subset of headteachers completed the same questionnaire twice within a two-week interval, yielding a Pearson correlation coefficient of $r=0.89$. Internal consistency was assessed using Cronbach's alpha, which was $\alpha=0.86$. Inter-coder reliability for qualitative data was established by having two independent coders code a random sample of 10% of the qualitative data, resulting in a percentage agreement of 92% [22].

4. Results

This section presents the findings of the study on the impact of socio-economic factors on the adoption of Information and Communication Technology (ICT) tools by headteachers in basic schools in the Wa Municipality, Ghana. The results are organized into four main sections: demographic analysis, ICT infrastructure and usage patterns, socio-economic barriers, and regression analysis.

4.1. Demographic Analysis

The study involved 200 headteachers from basic schools in the Wa Municipality. The demographic profile of the participants is summarized in Table 1.

Table 1 Demographic Profile of Participants

Variable	Category	Count (n=200)	Percentage (%)
Gender	Male	103	51.5
	Female	97	48.5
Age Group	20–30	45	22.5
	31–40	49	24.5
	41–50	48	24.0
	51+	58	29.0
Educational Qualification	Diploma/Certificate	53	26.5
	Bachelor's Degree	46	23.0
	Master's Degree	51	25.5
	Other	50	25.0
Experience	1–5 years	45	22.5
	6–10 years	50	25.0
	11–15 years	58	29.0
	16+ years	47	23.5
Location	Urban	89	44.5
	Rural	111	55.5
Income Bracket	Below 2,000	59	29.5
	2,000–3,500	45	22.5
	3,501–5,000	54	27.0
	Above 5,000	42	21.0
Device Ownership	Smartphone only	71	35.5
	None	66	33.0
	Both (PC & Smartphone)	63	31.5

The sample is fairly balanced in terms of gender, with slightly more male headteachers (51.5%) than females (48.5%). The majority of respondents fall into the older age brackets, with 29% aged 51+ and only 22.5% aged between 20–30. The respondents are relatively well-qualified, with nearly half holding either a Master's degree (25.5%) or a Bachelor's degree (23%). The majority of participants (55.5%) come from rural areas, highlighting the importance of addressing infrastructural disparities between urban and rural settings.

4.2. ICT Infrastructure and Usage Patterns

The availability of ICT infrastructure in schools is summarized in Table 2.

Table 2 ICT Infrastructure Availability

Feature/Frequency	Number of Schools (out of 200)	Percentage (%)
Functional computer lab	85	42.5
Reliable electricity supply	110	55.0
Stable internet connection	70	35.0
School management software	45	22.5
None of the above	30	15.0

Only 42.5% of schools reported having a functional computer lab, and just 35% had stable internet connectivity. The frequency of power outages was also a significant issue, with 20% of schools experiencing daily disruptions and 30% reporting weekly interruptions.

ICT usage patterns among headteachers are summarized in Table 3.

Table 3 ICT Usage Patterns

Task	Mean (1-5, 1=Never, 5=Always)	Standard Deviation
Record-keeping	3.67	1.17
Communication with staff/parents	4.05	1.05
Financial management	2.69	1.39

Communication with staff and parents was the most frequently used ICT function (mean = 4.05), followed by record-keeping (mean = 3.67). Financial management had the lowest mean score (2.69), indicating limited reliance on ICT tools for budgeting and accounting.

4.3. Socio-Economic Barriers

The socio-economic barriers to ICT adoption are summarized in Table 4.

Table 4 Socio-Economic Barriers

Limiting Factor	Number of Participants (out of 200)	Percentage (%)	Average Rank (1-5, lower is more severe)
High cost of devices/data	75	37.5	1.9
Lack of technical skills	40	20.0	2.5
Limited time for training	25	12.5	3.1
Cultural resistance to technology	15	7.5	3.8
Poor infrastructure (electricity/internet)	45	22.5	2.2

The high cost of devices and data was ranked as the most severe limiting factor, with 75 participants (37.5%) citing it as the top issue. Lack of technical skills and poor infrastructure were also significant barriers, with average ranks of 2.5 and 2.2, respectively.

4.4. Regression Analysis

A multiple regression analysis was performed to identify the socio-economic and demographic factors that most strongly predict ICT adoption among headteachers. The dependent variable was the frequency of ICT use for various school management tasks, while the independent variables included age, monthly income level, and access to formal ICT training in the past three years.

Table 5 Regression Analysis Results

Predictor	B (Beta Coefficient)	P-value	Interpretation
Income Level	0.41	<0.001	Higher income significantly increases ICT adoption.
Formal ICT Training	0.37	<0.001	ICT training significantly increases ICT adoption.
Age	-0.19	0.012	Older headteachers are less likely to adopt ICT tools.

The regression model explained 58% of the variance in ICT adoption ($R^2 = 0.58$, $p < 0.001$). Income level and access to ICT training emerged as the strongest predictors of ICT adoption, with age playing a secondary but still significant role.

The study reveals that socio-economic factors, particularly income levels and access to training, significantly influence the adoption of ICT tools by headteachers in basic schools in the Wa Municipality. While there is a willingness among headteachers to integrate ICT into school management, structural and systemic barriers limit its effective implementation. The findings highlight the need for targeted policy interventions that address infrastructural disparities, provide financial support, and offer structured professional development programs to enhance ICT integration in basic schools.

5. Discussion

The study on the impact of socio-economic factors on the adoption of Information and Communication Technology (ICT) tools by headteachers in basic schools in the Wa Municipality, Ghana, revealed several key insights that underscore the multifaceted challenges and opportunities associated with ICT integration in educational settings.

The demographic profile of the 200 headteachers surveyed indicates a balanced gender distribution, with a slight majority of male headteachers (51.5%) compared to female headteachers (48.5%). The majority of respondents were older, with 29% aged 51+ and only 22.5% aged between 20–30. This suggests that most headteachers have significant experience in the field. The respondents were relatively well-educated, with nearly half holding either a Master's degree (25.5%) or a Bachelor's degree (23%). The majority of participants (55.5%) were from rural areas, highlighting the importance of addressing infrastructural disparities between urban and rural settings. Financial constraints were evident, with 29.5% of respondents earning less than GHS 2,000 per month, and 33% not owning any computing device, indicating limited personal access to ICT tools.

The availability of ICT infrastructure in schools was found to be a significant determinant of ICT adoption. Only 42.5% of schools had a functional computer lab, and just 35% reported stable internet connectivity. The frequency of power outages was a major issue, with 20% of schools experiencing daily disruptions and 30% reporting weekly interruptions. These infrastructural challenges, particularly in rural areas, severely limit the ability of headteachers to adopt digital systems for administrative tasks such as record-keeping, communication, and financial management.

ICT usage patterns revealed that communication tasks were the most frequently adopted, with a mean score of 4.05, followed by record-keeping (mean = 3.67). Financial management had the lowest mean score (2.69), indicating limited engagement with digital financial tools. This suggests that while headteachers are willing to use ICT for basic tasks, more complex administrative functions remain underutilized due to a combination of low technical capacity and inadequate institutional support.

Socio-economic factors emerged as critical barriers to ICT adoption. The high cost of devices and data was identified as the most severe limiting factor, with 75 participants (37.5%) citing it as the top issue. Lack of technical skills and poor

infrastructure were also significant barriers, with average ranks of 2.5 and 2.2, respectively. Limited access to training opportunities further exacerbated these challenges, with only 30% of participants having received employer-funded ICT training in the past three years. Cultural resistance and community expectations also played a role, with some parents and stakeholders preferring traditional methods over digital alternatives.

The regression analysis identified income level and access to ICT training as the strongest predictors of ICT adoption, explaining 58% of the variance in ICT usage frequency. Higher income significantly increased the likelihood of ICT adoption ($\beta = 0.41$, $p < 0.001$), while access to formal ICT training also had a strong positive effect ($\beta = 0.37$, $p < 0.001$). Age had a negative but statistically significant correlation with ICT adoption ($\beta = -0.19$, $p = 0.012$), indicating that older headteachers were less likely to adopt ICT tools.

The study concludes that while there is a growing recognition among headteachers of the importance of ICT in school management, actual implementation remains uneven and largely constrained by socio-economic and infrastructural limitations. The findings highlight the need for targeted policy interventions that address infrastructural disparities, provide financial support, and offer structured professional development programs to enhance ICT integration in basic schools. By addressing these socio-economic barriers, stakeholders can foster a more inclusive and effective environment for digital transformation in education, ultimately contributing to improved teaching, learning, and governance outcomes at the basic school level.

6. Conclusion

The study on the impact of socio-economic factors on the adoption of Information and Communication Technology (ICT) tools by headteachers in basic schools in the Wa Municipality, Ghana, has revealed several critical insights. The findings indicate that while there is a general willingness among headteachers to integrate ICT into school management, the actual implementation is significantly hindered by socio-economic and infrastructural limitations.

Key findings include

- **Income Levels:** Financial constraints, particularly low income levels, limit headteachers' ability to invest in personal computing devices and maintain consistent internet access. This is a significant barrier, with 70% of respondents indicating that their income affects their ability to purchase ICT tools.
- **Access to Training:** Only 30% of participants had received employer-funded ICT training in the past three years. Training emerged as a crucial enabler of ICT use, with a strong positive effect on ICT adoption.
- **Cultural and Social Norms:** Cultural resistance and community expectations significantly influence ICT adoption. Approximately 35% of respondents reported that community expectations affect their ICT adoption decisions, with some parents and stakeholders preferring traditional methods over digital alternatives.
- **Urban-Rural Divide:** Urban schools generally have better access to ICT infrastructure, including stable electricity, internet connectivity, and technical support. In contrast, rural schools face significant challenges, including erratic electricity supply, poor internet access, and limited training opportunities.
- **ICT Usage Patterns:** ICT tools are primarily used for communication tasks, with a mean score of 4.05. Record-keeping had a mean score of 3.67, while financial management had the lowest mean score (2.69), indicating limited engagement with digital financial tools.

The regression analysis identified income level and access to ICT training as the strongest predictors of ICT adoption, explaining 58% of the variance in ICT usage frequency. Higher income significantly increased the likelihood of ICT adoption, while access to formal ICT training also had a strong positive effect. Age had a negative but statistically significant correlation with ICT adoption, indicating that older headteachers were less likely to adopt ICT tools.

Recommendations

Based on the findings, the following recommendations are proposed to enhance ICT integration in basic schools:

- **Targeted Financial Support:** Subsidize access to personal computing devices and mobile data for low-income headteachers. Establish community-based ICT hubs to provide shared access to computing resources.
- **Structured Professional Development:** Introduce mandatory ICT training programs tailored to different experience levels. Collaborate with teacher training institutions to integrate ICT leadership modules into pre-service and in-service training curricula.

- **Community Engagement:** Conduct awareness campaigns to demonstrate the benefits of ICT in education. Involve local leaders, parent-teacher associations, and community members in discussions about digital transformation.
- **Policy Interventions:** Allocate targeted funding for infrastructure development in rural schools. Strengthen monitoring and evaluation mechanisms to ensure equitable implementation of ICT policies.

By addressing these socio-economic barriers, stakeholders can foster a more inclusive and effective environment for digital transformation in education, ultimately contributing to improved teaching, learning, and governance outcomes at the basic school level.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Authors Contributions

- Y, Sidiki¹ conceptualized the study and led the writing of the introduction and discussion.
- SA Gyamfi² provides guided supervision and coordinates edits across sections.
- SN Nikoi³ designed the methodology, led data collection, analyzed results, supported the interpretation of findings, and wrote the conclusion.
- BA Buer⁴ conducted the literature review and contributed to referencing and formatting.

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