

## Research Article

# Status of ICT Integration in Secondary Schools: Dire Dawa City Administration in Focus

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The purpose of this study was to explore the status of information and communication technology integration in Dire Dawa City Administration secondary schools' curriculum. The study was conducted using a survey design. A total of 563 respondents (374 students and 189 teachers), four school supervisors, and 12 school principals and vice principals were selected using systematic random and purposive sampling techniques from the eight secondary schools. Data were gathered by questionnaire, interview, and observation. The data were analyzed using mean, standard deviation, and an independent sample *t*-test. The findings revealed that the integration of information and communication technology was minimal and inconsistent across secondary schools. It was found that there was a significant mean difference in the integration of information and communication technology between private and government secondary schools. The study revealed that lack of training and technical knowledge, the high cost of technological devices and internet service, and a lack of internet connectivity were major challenges. A shortage of computers in private schools and a lack of enthusiasm in government secondary schools were particular problems mentioned by respondents. As a result, it is critical to establish a rigorous monitoring and control mechanism to improve the current practices through the provision of necessary facilities. It is recommended that schools, in partnership with the Dire Dawa City Administration Education Bureau, should arrange training on raising awareness and developing the necessary skills for effective integration of information and communication technology into the curriculum.

## 1. Introduction

Information and communication technology (ICT) has been impacting every element of life, business, and education, and this digital age has revolutionized every element of human life [1]. ICT is considered as a driver and enabler for building and strengthening numerous sectors, including learning [2]. Schools use a varied set of ICT tools to communicate, create, disseminate, store, and manage information. Today, ICT has also become integral to the teaching–learning interaction, through such approaches as replacing chalkboards with interactive digital whiteboards, using students' own smartphones or other devices for learning during classtime, where students watch lectures at home on the computer and use classroom time for more interactive exercises [3, 4].

ICT is a technology that transmits, manipulates, and stores data electronically. This includes email, SMS, video

chat (like Skype), and online social media (e.g., Facebook). All computing devices, including computers and smartphones, that perform various communication and information functions are included [5]. It comprises radio, television, cell phones, computers, satellite systems, services, and applications such as video conferencing and distant learning, as well as network hardware and software [6]. All of these are essential for facilitating student learning and ensuring quality education [7, 8].

As the penetration of ICTs increased across the African continent in the late 2000s and early 2010s, the focus started to shift to the uptake and impact of these ICTs in order to transform society and the economy. It is believed that fostering digital opportunities and social inclusion by enhancing the use of ICT for capacity building, empowerment, governance, and social participation; scientific research, information sharing, exchanges of knowledge, and learning opportunities are

the need of the day [9]. According to Krajewski and Khoury [10], ICT can help teachers and students create rich, multisensory, and interactive learning environments. This means an education with ICT that adds pedagogical and learning values to enhance the quality, access, and efficiency of the education systems in the classroom and beyond.

The Ethiopian government has been implementing ICT such as plasma to give standardized education to all secondary school students. The new Education and Training Policy also emphasizes scientific knowledge and practical experience with the established ICT policy in the educational system [11]. Accordingly, the policies are expected to be a framework for expanding educational opportunities, modernizing the educational system, and improving educational provision [12]. Education Sector Development Programme VI [13] and the ICT Implementation Strategy [14] recognize ICT as an enabler for widening access to education for the Ethiopian population, supporting literacy education, and facilitating educational delivery and training at all levels.

However, technical issues such as user acceptance, particularly among inexperienced teachers, hardware and software standards, interoperability, technology security, institutional issues, and financial issues all pose significant barriers to ICT use in schools and should be considered during implementation and use [3]. Ethiopian schools at all levels have limited access to ICTs due to a lack of infrastructure and high costs [15]. Thus, in underdeveloped countries, a critical mass of teachers and students who use ICT for learning and teaching has not been reached, and many of the ideas are still being studied for their relevance, applicability, and cost-effectiveness [16, 17].

In this regard, not only in the secondary schools in Dire Dawa City Administration but in the nation as well, ICT is believed to have the potential to improve the quality of education by providing new tools for improving access to education and sharing knowledge [18]. However, studies have shown that problems with the application and use of ICTs have been linked to Ethiopian education systems and services being poorly understood, unmanaged, and under-resourced [19–21].

Since the effectiveness of education depends on the quality of sharing knowledge and skills inside and outside the classroom, this study considered ICT as a tool or a means of communication in the learning and teaching process, ensuring quality learning in the study area. Thus, to identify and understand the current status of ICT integration, the existing context should be investigated to transform the learning and teaching scenario into better improvements. This requires access to up-to-date information, identifying challenges and creating opportunities to communicate and exchange information with others.

It is well understood that the advancement of ICT has generally been given top priority by the Ethiopian government. The government's commitment to using ICT for education is also demonstrated by the new ICT workforce structure. It has implemented with various pay packages. The establishment of a sizable ICT infrastructure demonstrates the interest that secondary schools have in employing ICT. However, usage of

ICT-supported learning systems and the creation of digital library systems are either very low or nonexistent, with the exception of a small portion of higher education. ICT is primarily utilized for services such as email and website hosting, as well as access to the internet. Therefore, this study primarily attempts to explore the current status of ICT integration in private and government secondary schools in Dire Dawa City Administration of Ethiopia and seeks answers to the subsequent research questions.

*1.1. Research Questions.* The study attempted to answer the following research questions:

- (1) To what extent ICT is integrated in private and government secondary schools of Dire Dawa City Administration?
- (2) How are private and government secondary schools different in integrating ICT in Dire Dawa City Administration?
- (3) What perplexities are encountered in the integration of ICT in private and government secondary schools in Dire Dawa City Administration?

## 2. Review of Related Literature

*2.1. Concept of Information and Communication Technology.* The current situation is supported by the notion that information is power and that different communication technologies are employed to spread information. ICT is a technology that is used to collect, produce, communicate, record, remanage, use, and transform the gathered data into usable information and knowledge. ICT today has transformed business practices and hastened societal transformation, creating a global community [22–24].

ICT is a term that refers to a synthesis of computer and communication technology. Computer technology is a means of storing and processing digital information [5]. Communication mediated by technology provides effective methods for increasing interaction with important stakeholders. These tools offer the chance for connection and engagement, while also giving organizations the ability to more effectively identify, analyze, and target their stakeholders with customized messaging through preferred channels [25]. Computing, networking, and information processing technologies, as well as their applications, might be characterized as ICT [23, 24]. ICT is an all-encompassing phrase that refers to both the hardware and software elements of electronic devices, including computers, radios, televisions, digital cameras, and phones [6]. It has acted as a driving force for advancement in society, the economy, education, science, and technology. ICT has significantly impacted teaching, learning, and research in education.

*2.2. Status of ICT in Ethiopian Education System.* Inquiring minds, independence, collaboration, and ownership of learning require a more suitable atmosphere and experiences. In this regard, the presence of ICT and its efficient application in a school have a great role in the effectiveness of learning and teaching [26].

ICT has brought differences in learning and teaching methods in industrialized nations such as the USA, Japan, Britain, France, and Germany in order to improve student learning and better prepare young people to live, learn, and work in a modern society [27]. One of the primary endeavors in developing nations to have reform programs aimed at education is the adoption of ICT in secondary schools [19]. Developing nations must make use of modern communication and information technologies and methods to spread fundamental knowledge and educate the general public [12]. Numerous studies show that in order to fully utilize ICT, the majority of developing nations should use the internet in education. This is due to the fact that social equality is among education's core principles [26].

According to a study done in secondary schools by Willis et al. [28], there is a relationship between teachers' use of ICT in the classroom and their ability to personalize, engage, and create an interactive environment for pupils. The country's educational and training development has been tracked by the Ministry of Education in terms of accessibility, equity, quality, efficiency, relevance, and learning outcomes [13]. Currently, data on education performance are gathered and processed by the Education Management Information System (EMIS), which can be used to enhance service delivery across the nation.

Research in the field of ICT enunciates that ICT holds great promise for contributing significantly to the kind of advancements made in the field of education. Consequently, it is becoming more and more necessary for instructors to integrate ICT into the modern classroom. ICT integration should not be considered as an addition to the curriculum. ICT use permeates all areas of socioeconomic development, according to Ethiopian Education and Training Policy [11], and the communications technology component of the formation is one of the components that will support the execution of the General Education Quality Improvement Programme.

Technology quickly becomes outdated, demanding the regular learning of new knowledge and abilities. The ICT curriculum in secondary schools should assist in creating groups of professionals with these fresh capabilities [4]. However, the current infrastructure appears to be a barrier to the proposed strategy. In Ethiopia, just 40% of schools have access to computers. Access to ICT, notably computers and the internet, is similarly restricted for teachers. It is, therefore, impossible to think that teachers could successfully include ICT into their lesson plans [29, 30].

In order to provide consistent education and quickly expand to improve and enrich the education provided to students, the government has also been integrating ICT. The government created the ICT policy and integrated it with the educational system at various levels, and Ethiopia's education and training policy also prioritizes the development of problem-solving skills education [11].

*2.3. Major Challenges to Integrating ICTs in Secondary Schools.* ICT implementation in schools is a crucial task for developing countries as researchers recognize that it may be used as a reliable instrument for raising educational

standards [19, 27]. However, the developing world encounters a variety of issues, such as a lack of funding, restricted internet access, a lack of qualified teachers, and a lack of legislation [28].

The difficulties with ICT integration in schools were categorized by Krajewski and Khoury [10] as being at the teacher, school, and system levels. Constraints at the teaching level include a lack of ICT proficiency, a lack of confidence on the part of the teacher, a lack of academic teacher preparation, a lack of creative follow-up, and a lack of training programs. A lack of ICT infrastructure, obsolete or subpar hardware, restricted access to ICT, a lack of project-related experience, and the absence of ICT integration plans into the school's policy are some of the difficulties faced at the school level. Traditional educational systems' rigid architecture, conventional evaluation, constrained curricula, and constrictive management structures are examples of system-level barriers.

Similar findings were made by Halili and Sulaiman [31], who discovered that behavioral intentions to utilize ICT for education were significantly influenced by enabling factors, social influence, performance expectations, and effort expectations. As a result, the study offers suggestions to assist authorities in getting the right technology equipment ready before introducing new technology to rural pupils.

The usage of ICT is significantly impacted by human resources, maintenance, culture, and money for education [32]. Another research outcome revealed that over 80% of instructors in underdeveloped countries feel unprepared to use technology. Many of these issues, nevertheless, might be seen as restrictions on the use of ICT in education. Challenges relating to students, technology, and teachers, thereby, limit the advantages of and/or the use of ICT in education [33].

### 3. Research Design and Methodology

The main aim of the study was to assess the status of ICT integration in private and government secondary schools in Dire Dawa City Administration. To achieve this goal, the study used a cross-sectional survey design that combined qualitative and quantitative research methods. A cross-sectional study is a type of survey research that analyzes data collected at one given point in time across a sample population or a predefined subset.

This study planned to consider all the eight (four private and four government) secondary schools in the Dire Dawa City Administration. Students, teachers, supervisors, and principals were considered. The sample students and teachers were chosen via stratified random sampling selection procedures; supervisors and principals were chosen using purposive sampling (a nonrandom sampling technique that utilizes a specific criteria or purpose to select particular sample) since they were the responsible and concerned bodies for the issue. Schools were chosen based on a systematic sampling procedure (systematic sampling is a statistical method involving the selection of elements from an ordered sampling frame).

TABLE 1: Sex versus school-type cross-tabulation.

Description	Respondents														
	Students						Teachers								
	Private		Government		Total		Private		Government		Total		Total Respondents		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Sex	Male	51	26.4	142	73.6	193	58.1	32	22.2	112	77.8	148	86.5	341	67.8
	Female	34	24.5	105	75.5	139	41.9	3	13	20	87	23	13.5	162	32.2
	Total	85	25.6	247	74.4	332	100.0	35	20.5	136	79.5	171	100.0	503	100.0

Source: Own survey result, 2017, No. = number, % = percent.

To determine each sample size, the following simplified formula [34] at 95% confidence level and level of precision = 5% (0.05) were used in fixing the sample size ( $n$ ) from total population ( $N$ ).

$$\text{Sample size } (n) = \frac{N}{1 + N(e^2)}. \quad (1)$$

Overall, 189 (53%) teachers, 374 (6.4%) students, 8 (100%) supervisors, 8 (100%) principals, and 8 (100%) vice principals were selected. Out of the total sample, 587 participants (189 teachers and 374 students) were surveyed through questionnaires. A questionnaire constitutes a set of written questions on a sheet with spaces provided for respondents to reply to the items (questions). The tool used because its potential to reach out to many respondents within a short time and its ability to give the respondents adequate time to respond to the items. The internal consistency of the questionnaire was assessed using Cronbach's  $\alpha$  ( $>0.78$ ). As their number is very limited and manageable in size, a semistructured interview was developed for vice principals, principals, and supervisors. In common parlance, the word interview refers to a one-on-one conversation between an interviewer and an interviewee. The interviewer poses questions to the interviewee, who usually responds with information. Extracts from interviews were analyzed using thematic description and narration.

As to the limitations of the study, the data should be viewed as illustrative rather than exclusive since it solely reflects the Dire Dawa City Administration in Ethiopia. The study focuses especially on examining the use of ICT in teaching and learning. Specific respondents on the research sites do not always represent the views of the entire world, and the findings, interpretations, and conclusions expressed in the report are solely those of the authors.

## 4. Results and Discussion

**4.1. Characteristics of Respondents.** All the 563 respondents received the questionnaire (374 students and 189 teachers). Of them, 503 respondents in total (332 students or 88.8% and 171 teachers or 90.5%) were returned to the researchers, achieving a good success rate of 89.3%. The study of this report covers subtopics such as the respondents' sex, grade level, age, experience, and qualifications.

TABLE 2: Students grade level versus school-type cross-tabulation.

No.	Description	Students					
		Private		Government		Total	
		No.	%	No.	%	No.	%
2.	9th	49	25.3	145	74.7	194	58.4
	10th	36	26.1	102	73.9	138	41.6
	Total	85	25.6	247	74.4	332	100.0

Source: Own survey result, 2017, No. = Number, % = percent.

As shown in Table 1, there was a wider gender disparity among the respondents, with 341 (67.8%) men and 162 (32.2%) women responding. In comparison to female responses, it shows a masculine bias. This can be a sign of insufficient female participation. The historical imbalance between men and women's access to school may be the cause of the bigger gender gap among responders. Therefore, efforts should be made to increase the number of women enrolled in secondary education. A study by Tondeur et al. [35] found that women have a less positive perception of computers in general. This relates to the variable sex and students' use of ICT. They adopt the same attitude toward using computers for education as men do, though. Similar to this, gender and computer use for leisure activities have a negative link, but not for computer use for academic purposes.

Table 1 shows that 85 students (25.6%) attended private secondary schools, whereas 242 students (74.4%) attended government secondary schools. Similar to this, 35 teachers (20.5%) worked in private secondary schools, whereas 136 teachers (79.5%) taught in government secondary schools. Because of this, the samples used were adequate to allow for the proper use of quantitative analysis, to draw dependable conclusions and suggestions.

Table 2 reveals that 194 respondents (58.4%) were in the ninth grade and 138 respondents (41.6%) were in the tenth grade. According to the results of the descriptive study, more learners were in grade 9 than in grade 10, on average. In essence, this implies a favorable tendency toward secondary education. The statistics also indicate that 85 (25.6%) and 247 (74.4%) of the pupils are enrolled in private and public schools, respectively. Students that attend private schools in Ethiopia typically have higher socioeconomic statuses. According to a study by Scherer and Siddiq [36], the relationship between socioeconomic status and ICT literacy was smaller than those seen in other subject areas such as mathematics and reading.



TABLE 3: Teachers’ age versus school type cross-tabulation.

Description	Teachers						
	Private		Government		Total		
	No.	%	No.	%	No.	%	
Age (years)	25 and below	7	23.3	23	76.7	30	17.5
	26–30	17	63	10	37	27	15.8
	31–35	10	16.7	50	83.3	60	35.1
	36 and above	1	1.9	53	98.1	54	31.6
	Total	35	20.5	136	79.5	171	100.0

Source: Own survey result, 2017, No. = number, % = percent.

TABLE 4: Teachers’ work experience versus school-type cross-tabulation.

Description	Teachers						
	Private		Government		Total		
	No.	%	No.	%	No.	%	
Experience	0–2	7	23.3	23	76.7	30	17.5
	3–5	18	41.9	25	58.1	43	25.1
	6–8	10	13.7	63	86.3	73	42.7
	9-above	0	0	25	100	25	14.6
	Total	35	20.5	136	79.5	171	100.0

Source: Own survey result, 2017, No. = Number, % = percent.

According to Table 3, there were 60 respondents who were between the ages of 31 and 35 years, 54 respondents who were over the age of 35 years, 30 respondents who were under the age of 26 years, and 27 respondents who were between the ages of 26 and 30 years. This suggests that the sampled respondents were almost all adults who could contribute to the country’s continued development. Regarding teacher age and school type, the majority of teachers worked at government secondary schools, where 53 teachers (98.1%) were between the ages of 36 years and above, while 17 teachers (63%) were in the 26–30 age range for private secondary schools. This finding shows that the majority of instructors at private secondary schools were vibrant, young individuals. Alufohai and Ibhafidon [37] found that while teachers’ gender may not have a significant impact on students’ academic achievement, their age and marital status have a significant impact. Such research findings might also be useful for teachers who want to use ICT in the classroom.

As shown in Table 4, the majority of respondents [73 (42.7%)] had between 6 and 8 years of work experience; 43 (25.1%) had between 3 and 5 years of work experience; 30 (17.5%) had under 2 years of work experience; and 25 (14.6%) had more than 9 years of work experience. This indicates that the majority of sampled respondents possessed the necessary work experience to demonstrate their performance. In a study conducted by Irvine [38], a conclusion reached that “all other things being equal, teachers with more experience are better teachers to augment students’ performance.” Similar to this, Kola and Sunday [39] confirmed that one indicator of a teacher’s credentials—the number of years of experience—is believed to be a significant

TABLE 5: Teachers’ qualification versus school type cross-tabulation.

Description	Teachers						
	Private		Government		Total		
	No.	%	No.	%	No.	%	
Qualification	B.A./B.Sc./ B.Ed.	34	20.2	134	79.8	168	98.2
	MA/MSc	1	33.3	2	66.7	3	1.8
	Total	35	20.5	136	79.5	171	100.0

Source: Own survey result, 2017, No. = number, % = percent.

predictor of students’ academic progress. This suggests that knowledgeable ICT teachers will greatly enhance students’ performance by including pertinent and helpful ICT material.

Teacher experience and school type indicate that the majority of teachers worked in private secondary schools; 18 (41.9%) had 3–5 years of work experience; 63 (86.3%) had 6–8 years of work experience. This data reveal that the majority of teachers in government secondary schools were more effective and accountable than their colleagues in private secondary schools.

Almost all 168 (98.2%) of the instructor participants had first-degree credentials in terms of education. This demonstrates that secondary schools comply with the requirement that teachers hold a Bachelor’s degree or higher. This shows that secondary schools deliver a competent education attributable to their good preparation in incorporating ICT in learning and teaching. According to a study by Musau and Migosi [40], attributes such as teachers training or ongoing professional development may help students perform better, which may increase the teachers’ satisfaction and commitment to their teaching careers. Oloolube [41] conducted a special study on staff education and training that amply indicated the necessity to give teachers better opportunities to learn and grow in order to establish a link between their work and student achievement. Teachers’ qualification versus school-type cross-tabulation are shown in Table 5.

#### 4.2. Level of ICT Integration

4.2.1. Students’ Response Regarding the State of ICT Integration. As depicted from Table 6, items 1, 2, 3, and 7, majority of private student respondents used computers (item 1,  $\bar{X} = 2.15$ ;  $\sigma = 0.56$ ), a smartphone (item 2,  $\bar{X} = 2.84$ ;  $\sigma = 0.80$ ), and internet mobile data connections (item 7,  $\bar{X} = 2.81$ ;  $\sigma = 0.76$ ) to effectively gather information for assignment tasks at moderate level. On the contrary, majority of government schools’ students used computers (item 1,  $\bar{X} = 2.65$ ;  $\sigma = 0.83$ ), smartphones (item 2,  $\bar{X} = 2.41$ ;  $\sigma = 0.65$ ), and internet mobile data connections (item 3,  $\bar{X} = 2.32$ ;  $\sigma = 0.63$ ) to effectively gather information for assignment tasks at low level.

Similarly, as shown in Table 6, majority of private secondary schools’ student used Wi-Fi (item 8,  $\bar{X} = 1.41$ ;  $\sigma = 0.49$ ) and/or broadband connection (item 9,  $\bar{X} = 2.08$ ;  $\sigma = 0.77$ ) and packaged applications (item 10,  $\bar{X} = 1.66$ ;

TABLE 6: Students' response regarding the state of ICT integration.

Items	Type of the school	$\bar{X}$	$\sigma$	$t$ -test	$p$ -value
1. I use a computer to improve my learning	Private	2.65	0.83	6.119	.000
	Government	2.15	0.56		
2. I use a smartphone for educational purpose	Private	2.84	0.80	4.860	.000
	Government	2.41	0.65		
3. I effectively gather information by ICT for doing my assignment	Private	2.74	0.80	4.990	.000
	Government	2.32	0.63		
4. I use ICT (computer, smartphone) to read soft copy learning materials (PDF, Word.doc) and reference books	Private	2.14	0.91	3.725	.000
	Government	1.89	0.31		
5. I use ICT (computer, smartphone) at my home for learning purpose.	Private	2.31	1.00	5.949	.000
	Government	1.78	0.56		
6. I use ICT (computer, smartphone) at my school for learning purpose	Private	1.98	0.41	-5.002	.000
	Government	2.36	0.67		
7. I use mobile data connection to search learning materials	Private	2.81	0.76	5.922	.000
	Government	2.32	0.63		
8. I use Wi-Fi connection to search learning materials	Private	1.68	0.49	4.413	.000
	Government	1.41	0.49		
9. I use broadband connection to search learning materials	Private	2.08	0.77	14.760	.000
	Government	1.15	0.36		
10. I use packed application (such as a dictionary) for learning	Private	1.66	0.88	3.068	.002
	Government	1.42	0.49		
11. I use data transferred applications such as C-share, Bluetooth, Xender, and so on to share learning materials with my friends.	Private	2.06	0.68	7.077	.000
	Government	1.57	0.50		
Grand mean	Private	2.27	0.55	61.159	.000
	Government	1.89	0.27		

Source: Own survey result, 2017, No. = number, % = percent,  $F$  = frequency,  $\bar{X}$  = mean;  $\sigma$  = standard deviation, degree of freedom = 330, at 0.01 significance level.

$\sigma = 0.88$ ) at low level. On the other hand, majority of government secondary schools' student used Wi-Fi (item 8,  $\bar{X} = 1.86$ ;  $\sigma = 0.49$ ) and/or broadband connection (item 9,  $\bar{X} = 1.15$ ;  $\sigma = 0.36$ ) and packaged applications (item 10,  $\bar{X} = 1.42$ ;  $\sigma = 0.49$ ) at a very low level.

As shown in Table 6, the  $t$ -test indicated a statistically significant mean difference in student respondents' replies to the usage of ICT devices [a computer (item 1, ( $t(330) = 6.119$ ;  $p \leq 0.01$ ), a smartphone (item 2, ( $t(330) = 4.860$ ;  $p \leq 0.01$ ), software applications [packaged applications (item 10, ( $t(330) = 3.068$ ;  $p \leq 0.01$ ) and data transferred applications (item 11, ( $t(330) = 7.077$ ;  $p \leq 0.01$ ), and internet connections [mobile data (item 7,  $t(330) = 5.922$ ;  $p \leq 0.01$ ), Wi-Fi (item 8,  $t(330) = 4.413$ ;  $p \leq 0.01$ ), and/or broadband connection (item 9,  $t(330) = 14.760$ ;  $p \leq 0.01$ )] to gather information (item 3,  $t(330) = 4.990$ ;  $p \leq 0.01$ ), for study (item 4,  $t(330) = 3.725$ ;  $p \leq 0.01$ ), and search and share learning materials, such as soft copy learning materials and reference books, at home (item 5,  $t(330) = 5.949$ ;  $p \leq 0.01$ ) and/or school (item 6,  $t(330) = -5.002$ ;  $p \leq 0.01$ ).

It is irrefutably true that pupils in private secondary schools incorporate ICT more quickly than most students in public secondary schools. ICT was not integrated into classrooms, according to the questionnaire and school observation results. All secondary schools' policies prohibit pupils from using smartphones on school property. This is also true

here. Additionally, only staff members were permitted to use the school's broadband connection. While Wi-Fi is present in most government secondary schools in Dire Dawa City Administration, it is password-protected and only available to teachers and administrative employees inside the school property. According to a study by Ramli and Zain [42], inadequate facilities are linked to low student attendance, which can reduce exam performance. The study also supported the idea that insufficient school infrastructure can have a detrimental impact on students' academic performance and attendance.

In a similar vein, the researchers found that government secondary schools' ICT lab classrooms were better organized and supportive of good ICT integration than those in private secondary schools. However, compared to government-sponsored secondary schools, private secondary schools maintained and updated their resources more frequently. Meaningful learning is inextricably tied to classroom setup that supports ICT integration activities. In this regard, research has shown that ICT will help teachers keep up-to-date on instructional practices based on ICT. It will foster an interactive environment where students and teachers can discuss the issue at hand in a classroom setting. ICT aids students in a variety of ways, such as by piquing their interest and boosting their motivation for a given subject [7, 18].

TABLE 7: Independent samples test on the level of ICT integration in secondary schools.

	Type of the school	$\bar{X}$	$\sigma$	$t$ -test	$p$ -value
Level of ICT integration	Private	1.725	.196	9.071	.007
	Government	1.394	.193		

Source: Own survey result, 2017,  $\bar{X}$  = mean;  $\sigma$  = standard deviation, at 0.01% significance level.

In addition to this, during key informant interview session, one of the school teacher and supervisor (S1) stated:

*Undoubtedly, the environment in government secondary schools is supportive of ICT integration. However, students attending private secondary schools integrated and exploited ICT more extensively for educational purposes. The skills of private secondary school students are not as poor and limited as those of government secondary school students. Because the majority of government secondary school students come from low-income families, they do not have access to ICT devices at the same stage as private secondary school students who come from wealthy and accessible families.*

In addition to this reflection, another school principal (P1) in government school added:

*Although it is impossible to argue that ICT is fully integrated into secondary schools, it is practicable in our school. Overall, management reports and training have been automated, and we are currently working on seating arrangements and enabling schools in integrating ICT for learning.*

This analysis demonstrates how low the status of ICT integration in secondary schools was, and how well ICT was actually incorporated into teaching and learning in both private and public secondary schools. According to a study by Ghavifekr and Rosdy [43], integrating ICT into the classroom is very effective for both teachers and students. Findings show that one of the key elements in the success of technology-based teaching and learning is teachers who are well prepared with ICT tools and resources. Additionally, it was shown that teacher professional development training programs were crucial in raising the standard of learning.

To sum up, Table 6 shows aggregate  $t$ -test results [ $t(330) = 61.159$ ;  $p \leq 0.001$ ] along with the mean scores for private schools ( $\bar{X} = 2.27$ ,  $\sigma = 0.55$ ) and government schools ( $\bar{X} = 1.89$ ,  $\sigma = 0.27$ ) revealed that there was a statistically significant difference between the two. The results showed that although the level of integration was low, private secondary schools had a better level of ICT integration than government secondary schools. Overall, there was a big variation in how ICT integration was handled in public and private secondary schools.

*4.2.2. Teachers' Responses about the Status of ICT Integration in Education.* As shown in Table 7, the computed mean score ( $\bar{X} = 1.725$ ,  $\sigma = 0.192$ ) for private secondary schools and ( $\bar{X} = 1.394$ ,  $\sigma = 0.193$ ) for government secondary schools indicated that teachers valued a low level of ICT integration in private secondary schools and a very low level of ICT integration in government secondary schools. Additionally, the independent  $t$ -test result indicates that there is no statistically significant difference in teacher responses between private and government secondary schools ( $t(169) = 0.315$ ;  $p < 0.01$ ). This means that both government and private schools did not integrate ICT to improve academic achievement, while private secondary schools do so more than their government counterparts.

The checklist was used by the researchers to assess the degree of ICT integration during the observation session in addition to the questionnaire. The majority of instructors, with the exception of department leaders, do not have access to private computers despite the fact that schools have broadband. Additionally, inside the school grounds, teachers used Wi-Fi internet access on their smartphones, but only for social media and not for educational purposes.

Teachers in private secondary schools appear to be busy than those in public secondary schools. The observational data revealed that both government and private secondary schools have networked computers surrounding the faculty. In government secondary schools rather than private secondary schools, there were also networks available for teachers to use. However, the researchers came to know that neither faculty in private nor public secondary schools had any intentions to include ICT into their yearly or weekly lesson plans. In a related study, Asaolu and Fashanu [44] found that while public schools have made significant advancements in ICT over time, they continue to lag well behind private schools in this area. Therefore, the accountable entities should provide both institutions the attention they require.

When one of the teacher and supervisor (S2) shared his opinion about the state of ICT integration in secondary schools during the key informant interview, he uttered:

*Usually, both private and government secondary schools have relied on a textbook- and chalkboard-based teaching system. As a result, computers and smartphones have been viewed as leisure tools rather than learning instruments. To support students and teachers, the government should provide adequate information and training. Government secondary schools have better access to computers and the internet than*

TABLE 8: Independent samples  $t$ -test on challenges for ICT integration in secondary schools.

Type of the school	$\bar{X}$	$\sigma$	$t$ -test	$p$ -value	
Challenges	Private	3.2858	.56014	3.769	.050
	Government	3.3941	.59625		

Source: Own survey result, 2017,  $\bar{X}$  = mean;  $\sigma$  = standard deviation, at 0.05% significance level.

*private secondary schools. While the majority of secondary school teachers carried smartphones, teachers were not integrated and utilized ICT for pedagogical purposes.*

This reflection demonstrates that ICT integration was extremely limited in both private and government secondary schools of Dire Dawa City Administration. Similarly, Junaidi et al. [45] suggested that teachers and students' ineffective usage of ICT integration may be due to a lack of awareness of ICT integration. Guillén-Gámez et al. [1] also stated that teachers' computer skills are a significant predictor of integrating ICT into the teaching-learning process, and that both teachers and students' competence should be improved.

**4.3. Challenges that Hinder the Effective ICT Integration in Secondary Schools.** According to data in Table 8, the mean score of private ( $\bar{X} = 3.29$ ,  $\sigma = 0.56$ ) and government ( $\bar{X} = 3.39$ ,  $\sigma = 0.60$ ) respondents indicated that there was agreement on the challenges associated with integrating ICT in secondary schools. The  $t$ -test result [ $t(352) = 3.77$ ,  $p = 0.053$ ] suggested that no statistically significant difference existed between private and government secondary schools. This suggested that the major challenges associated with integrating ICT in secondary schools, whether private and government, were wide-ranging. This demonstrates that the private and government secondary schools of Dire Dawa City Administration experience the same challenges.

Similar to this, a casual review of the research team's findings found that both private and public secondary schools had difficulties integrating ICT, including insufficient internet connectivity, a dearth of laptop computers, and power outages. Effective ICT integration was also significantly hindered by the high cost of technical equipment, the high cost of internet access, a poor internet connection, and a lack of support from schools and the education department. Furthermore, neither government nor private secondary schools are well-equipped to handle the problems that come with incorporating ICT into their institutions. Many computers were malfunctioning and at danger of being destroyed owing to poor upkeep, especially in government secondary schools. The fact that students congregate in groups to use computers and appear reluctant to learn using the internet are more significant. Some students frequently do not think about how they may make the greatest use of their resources. The majority of pupils in both types of schools are, therefore, unhappy with how well ICT integration is working. The research conducted by Tomaro and Mutiarin [46] shows the difficulties that are related to the following: infrastructure and facilities (computers, etc.);

human resources (limited teacher training, low teacher motivation, and low technological knowledge); and finally the requirement for a technological leader who would be essential to successfully integrating ICT into the curriculum. In order to make it easier to integrate ICT into the curriculum, efforts should be taken to address any obvious problems.

In accordance with this, the vice principal and supervisor of the school were interrogated. The school's supervisor (also a teacher) (S3) stated the following opinion during the interview session:

*The issues associated with integrating ICT in schools are multifaceted, and they are more prominent in government schools than private government schools. The primary cause for this is a lack of awareness.... However, the majority of private teachers are young and comfortable with ICT. According to evidence, the number of internet cafes in Dire Dawa is gradually declining due to the high cost and slow speed of internet service. Thus, the majority of individuals have shifted to mobile data connections. In order to successfully integrate ICT into schools, the environment must be suitable for students. With these resources, implementing ICT integration is almost impossible or less likely.*

This study shows that although secondary school instructors in private schools were more aware of ICT integration than secondary school teachers in government schools, it was challenging to conclude that ICT was integrated in both types of schools. ICT integration in learning and teaching may be speed up by the availability of a number of services, including interactive internet cafes and high-quality, affordable internet access. The key barriers to ICT access can be divided into two groups, according to a similar study by Tamrat [47]: access to ICT infrastructure and access to ICT services. Despite some notable development in recent years, Ethiopians still have limited access to ICT infrastructure. He also pointed out that Ethiopia's internet bandwidth requirement is almost 20 times higher than that of low-income countries.

To substantiate this reflection, a teacher and a supervisor of the school reacted that:

*Compared to private secondary schools, the physical components of government secondary schools have been greatly facilitated by ICT devices such as computers. However, there is a positive attitude toward incorporating ICT into learning in private secondary schools. Private secondary schools, on the other hand, are more organized, and students begin learning ICT as a subject earlier.*

Interviewers were also conducted to consider the main difficulties they ran across when using ICT into the teaching



and learning procedures in their schools. In an interview session, school administrators claimed that there was a barrier to the adoption of new learning technologies and that the majority of students and instructors in their schools lacked the skills to actively incorporate ICT into the teaching and learning process. The majority of students, according to interviewers, lacked the skills and knowledge required for their grade level. Social media may, therefore, easily abuse them.

According to the above reflection, secondary school students in private schools were more conscious of the value of ICT integration than those in public schools. Even though government secondary schools had excellent infrastructure, ICT integration was lacking. Due to a lack of prior understanding of ICT, this suggests that government secondary school pupils have lower degrees of ICT integration. In conclusion, the information acquired through questionnaires, observations, and interviews shows that integrating ICT into both private and public secondary schools of Dire Dawa City Administration presents both individual and societal obstacles. According to a study by Amuko et al. [48], instructors confront numerous difficulties when using ICTs in the classroom, including the need to enhance their own technological expertise. Despite their enthusiasm, teachers were found to be slack in integrating technology into their lessons due to a lack of assistance for capacity building. The study, thus, suggests that new areas of technology integration be opened up to teachers and students for educational purposes in order to increase access to information, as well as that teachers' capacity for technology integration be increased and preservice teacher trainees' awareness of ICT integration in teaching and learning Mathematics be increased.

## 5. Conclusions and Implications

Increased teacher quality and funding for underperforming schools were recommended by Ethiopia's national ICT plan. In the Dire Dawa City Administration, there were differences in the secondary schools' exposure to ICT integration. According to the qualitative data presented, the results showed that the differences in students' math and science achievement between individuals and schools might be partially explained by their familiarity with ICT and exposure to technology. When creating educational environments, they understood that ICT is a crucial element that should be taken into account.

The results showed a very low level of ICT integration in Dire Dawa City Administration government secondary schools. As opposed to public secondary schools, private institutions integrate ICT less. This suggests that the government should pay attention to the formulation of an operating strategy for ICT use, boosting the knowledge and commitment levels of instructors and instructional leaders, and providing the necessary infrastructure.

Accordingly, the study revealed considerable obstacles to ICT integration in secondary schools run by the government and the commercial sector. These factors included a lack of

instruction, a lack of the technical know-how and skills required to use technology for learning, a lack of a smart-phone, the high cost of technological devices and internet service, a lack of an internet connection, a lack of interest in reading electronic materials, a lack of encouragement from schools and education offices, and a school's inability to consistently update software. However, when it came to integrating ICT, private secondary schools had a larger computer shortage than government secondary schools. In contrast to private secondary schools, however, one of the main challenges of government secondary schools in the Dire Dawa City Administration encountered was a lack of enthusiasm to integrate ICT into education.

The study's findings lead to the conclusion that the absence of explicit instructions and commitments regarding the use of ICT policy for pedagogical goals is the main barrier to ICT integration in teaching and learning. The administration unit in which the ICT service is organized, implementation problems, a lack of training for teachers and subject matter experts, and students' capacity to use ICT for learning are also considered to be among the most significant problems preventing the integration of ICT for pedagogical practices.

Researchers argue that investments in infrastructure, software, services, professional development (human capital), planning, implementation, and administration are crucial for the effective and efficient use of ICT to improve pedagogical practices. Using technology in education is essential when striving to achieve integration, particularly in important subject areas such as mathematics and science. This is due in large part to the fact that instructors are not utilizing it for teaching-learning as it is necessary for high-quality education. Schools should establish clear standards and rules to protect pupils from computer usage. Secondary schools should keep using and be prepared to upgrade their ICT equipment, whether they are private or public. They need to increase ICT integration more. In order to successfully integrate ICT into learning and teaching in both private and public secondary schools in Dire Dawa City Administration, school facilities must be enhanced.

Schools should work with the Dire Dawa Education Bureau and the relevant organizations responsible for the same to train teachers and students in ICT integration. Administrators and governments may want to encourage teachers to use ICT in settings where it can benefit students' learning. The integration of ICT and taking into account students' variety led to similar outcomes in several contexts, including Taiwan, Korea, Iran, and Macau, where students' learning was facilitated by these two factors [49–52].

## Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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