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DEPARTMENT OF COMPUTER SCIENCE

IMPLEMENTATION OF DIGITAL LITERACY PROGRAM IN PUBLIC PRIMARY SCHOOLS: A CASE STUDY OF MAKUENI COUNTY, KENYA

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A Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Information Technology Management of the University of Nairobi.

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DECLARATION

This project report is my original work and has, to the best of my knowledge, not been submitted anywhere else for any award in any institution of higher learning

Signature:_____   Date_____27th August 2021_____

Emmanuel Mwendwa Kyalo
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This report has been submitted to the University of Nairobi in partial fulfilment of the award of the degree of Master of Science in Information Technology Management with my approval as the university supervisor

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DEDICATION

I dedicate this research to all the village boys and girls who must strive through everything, many times on their own, to break the glass ceilings. As Lupita Nyong'o would say, all dreams are valid. Keep pushing.

ABSTRACT

The Government of Kenya, through *The Kenya Vision 2030,* has made deliberate efforts to transform the country into a middle-income, newly industrializing country providing a high quality of life in a secure and clean environment to all its citizens by 2030. This has been done through reforms and development across ten (10) main sectors, among them Science, Technology and Innovation.

Governments keen to reap from the benefits of technology need an effective and efficient way to manage digital literacy programs in public primary schools. There is therefore a need to determine the key factors that lead to slow or lack of implementation of digital literacy programs, despite the existence of proper policies, frameworks and guidelines for the process.

This study sought to investigate the slow implementation of the Digital Literacy Program (DLP) in public primary schools in Makueni County, Kenya. The study focused on three (3) tenets of the program: Infrastructure/Facilities; Choice of Digital Devices and Business Continuity Plans (BCP).

Purposive sampling, targeting only respondents involved in, with knowledge of or affected by the Digital Literacy Program in the target area was used. The respondents included teachers, pupils, headteachers, Ministry of Education and ICT officials as well as County Government officials. Secondary data was collected from relevant literature, government policy documents and publications. Primary data was obtained through focused interviews and structured questionnaires.

The study found that basic infrastructure and facilities, having the irreducible minimum of building standards, is an essential tool for effective learning. The choice of digital learning devices is equally important in digital learning. Business continuity plans play an important role in the implementation of digital literacy. Lack of training of relevant stakeholders, inadequate learning devices, power failures, resourcing issues (both human and financial), inadequate popularization of the DLP, mismatch of the existing Competency Based Curriculum and the DLP as well as lack of internet access were found to be of the key challenges hindering the implementation of the program.

The insights gained from this research could be used by the national government to establish better strategies that would catapult Kenya towards being a digitally literate country, achieve Vision 2030, the Government Big Four Agenda as well as the United Nations Sustainable Development Goals(SDG's).

To actualize digital literacy, the government should adopt strategies that ensure infrastructural facilities and digital devices chosen do have the bare minimum of requirements needed to function and operate. A business continuity framework, encompassing business policies, risk issues and improvement plans should be established to ensure the digital literacy program goes on uninterrupted.

Key Words: Digital Literacy Program, Digital Devices, Infrastructural Facilities, Business Continuity Management

TABLE OF CONTENTS

ACRONYMS

BC Business Continuity

BCMS Business Continuity Management System

BCP Business Continuity Plans

CBC Competency Based Curriculum

CDE County Directors of Education

DigCompEdu Digital Competence Framework for Educators

DigCompOrg Digital Competence Framework for Educational Organisations

DLM Digital Literacy Movement

DLP Digital Literacy Programme

ECDE Early Childhood Development and Education

EFL English as a Foreign Language

GOK Government of Kenya

ICT Information and Communications Technology

ISP Internet Service Provider

KSAVE Knowledge, Skills, Attitudes, Values and Ethics

LDD Learner Digital Device

NACOSTI National Commission for Science, Technology & Innovation

PDI-DML Personal Digital Inquiry model of Digital and Media Literacy

RDBL Reflective Design-based Learning

SDGs Sustainable Development Goals

TDD Teacher Digital Device

UNESCO United Nations Educational, Scientific and Cultural Organization

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

The United Nations Educational, Scientific and Cultural Organization (UNESCO) was established in 1945 to bring world peace and security through collaboration among nations in science, education, and communication culture as well as advance universal respect for the rule of law, justice, human rights and fundamental freedoms guaranteed to humanity, without differentiation in sex, race, religion or language. To accomplish its mission, UNESCO performs five (5) principal functions: Prospective studies on education, science, culture and communication for tomorrow's world; Standard-setting actions for the preparation and adoption of internal instruments and statutory recommendations; The advancement, transfer and sharing of knowledge through research, training and teaching activities; The exchange of specialized information and Expertise through technical cooperation to Member States for their development policies and projects (UNESCO, 2018). The United Nations General Assembly, In September 2015, adopted the 2030 Agenda for Sustainable Development that comprised seventeen (17) Sustainable Development Goals (SDG's). Goal 4 (Quality Education) had an objective of ensuring equitable and inclusive quality education and promoting lasting learning opportunities for everyone. Among the themes of Goal 4 was substantially increasing the number of youth and adults with the requisite skills, including vocational and technical skills, to enable them to be gainfully employed, have decent jobs and acquire entrepreneurship skills by 2030.

The promulgation of Kenya's new Constitution in August 2010 ushered a new era of devolution. The Constitution created 47 counties which formed the basis of service delivery to the citizens. According to Article 174 of the Constitution of Kenya, devolution aims at promoting social and economic development and providing easily accessible, proximate services throughout the country. Several sectors such as health were devolved. However, education was not fully devolved, with only Early Childhood Development and Education (ECDE) being devolved.

Kenya, following in the footsteps of the United Nations SDG program launched *The Kenya Vision 2030* aimed at transforming the country into a middle-income, newly industrializing country providing a high quality of life in a secure and clean environment to all its citizens by 2030. The aim of Kenya Vision 2030 was to create a prosperous and globally competitive country with a high quality of life by the year 2030. The Vision 2030 strategy focused on reforms and development across ten (10) crucial sectors, among them Science, Technology and Innovation. (GOK, 2020).

The Digital Literacy Programme (DLP), dubbed DigiSchool, was initiated in 2016 with the primary objective of integrating use of digital technologies in learning in all Public Primary Schools to enhance learning. The DLP was borne out of the Government of Kenya's resolve of ensuring that every pupil was prepared for today's digital world, as well as transforming learning in the country into an education system of the 21st century. The programme aimed at using ICT as a learning and teaching tool, as opposed to introducing ICT as a learning subject. It also hoped to enhance the learning and teaching

comprising content, devices, building of teachers' capacity and infrastructure (security, energy and connectivity) was carried out. The DLP devices provided included Learner Digital Device (LDD), Teacher Digital Device (TDD), Digital Content Server, Wireless Router, Projector and Braille Embosser. Each school was to receive a learning and teaching set comprising LDD's (tablets) based on the number of pupils in class One (1); one (1) projector; two (2) teachers' laptops; one (1) digital wireless server and braille embossers for learners with special needs. The LDD's were configured to have content for class 1 and 2.

The Government of Kenya (GOK) planned to start the programme with the lower primary but still have the devices used for the rest of the school. Since no content was developed for the upper classes, teachers could create their own content and use the devices to teach the upper classes as well. The programme started with a selection of 150 schools for a pilot study in August 2016. The GOK established a local assembly plant to assemble primary schools' laptops at Moi University and Jomo Kenyatta University of Agriculture and Technology (JKUAT). The GOK further undertook training of National Information Communication Technology (ICT) Champions, Basic ICT training of Trainers, Basic ICT training for teachers, ICT Training and Certification, and DLP Devices Handling training programmes. To enhance learner capability, the GOK undertook massive school's electrification programmes under the Last Mile Connectivity Programme to ensure primary schools were connected to the national power grid system.

By December 2017, the government did a self-evaluation and reported a success story. DLP devices had been supplied to more than 89.2 % of all the public primary schools, training of more than 91,000 teachers on device utilization had been accomplished, the pupil enrolment rate in the public primary schools had improved and over 95% of schools connected with power. (ICT Authority, 2017).

Since 2006, European economies and societies have faced major demographic and labour market changes as well as digital and technological innovations. Latest data shows that one in every five pupils in the European Union (EU) has inadequate proficiency in reading, science and mathematics. Many young people do not have the relevant digital competences (European Commission, 2018).

1.2 Statement of the Problem

Despite the Government of Kenya's efforts to implement the DLP, such as the issuance of the physical digital learning devices to schools, training of teachers on the use of ICT for training and connecting most schools to power, the implementation rate and frequency of the DLP is very slow. There is a need to interrogate the reasons for this slow actualization of the DLP.

1.3 Research Purpose

This study sought to investigate implementation of the DLP in public primary schools in Kenya, with Makueni County as the case study. The study sought to determine the reasons for its slow implementation, focusing on the main tenets of the implementation of the DLP in Kenya:

Infrastructure/Facilities; Choice of digital devices as well the Business Continuity Plans (BCP) of the DLP.

1.4 Research Objectives

The study was guided by the following study objectives:

1. Examine the choice of digital devices used in the DLP Program and their effect in the implementation of the DLP
2. Determine the influence of facilities on the implementation of the DLP
3. Assess the Business Continuity Plan of the DLP

1. 5 Research Questions

1. To what extent does the choice of digital devices influence implementation of DLP?
2. How do facilities affect the implementation of DLP?
3. Do Business Continuity Plans (BCP) exist in public primary schools?
4. What challenges, opportunities and issues have emerged during the DLP implementation and what measures have been taken to address them?

1.5 Research Justification

It was hoped that the insights gained from this research could be used as a roadmap to help the Government of Kenya achieve Vision 2030 Goals as well as the Big 4 Agenda. By focusing on Makueni, one of the 47 counties of Kenya, this study hoped to use the findings to provide a glimpse of what ailed the implementation of the DLP and thus provide a basis for guidance on how to implement the DLP in the other counties. It was hoped the study could be a reference point for further research.

CHAPTER 2: LITERATURE REVIEW

This chapter focuses on the review of related literature on implementation of the DLP, focusing on the choice of digital devices, the influence of ICT facilities/infrastructure and Business Continuity Management.
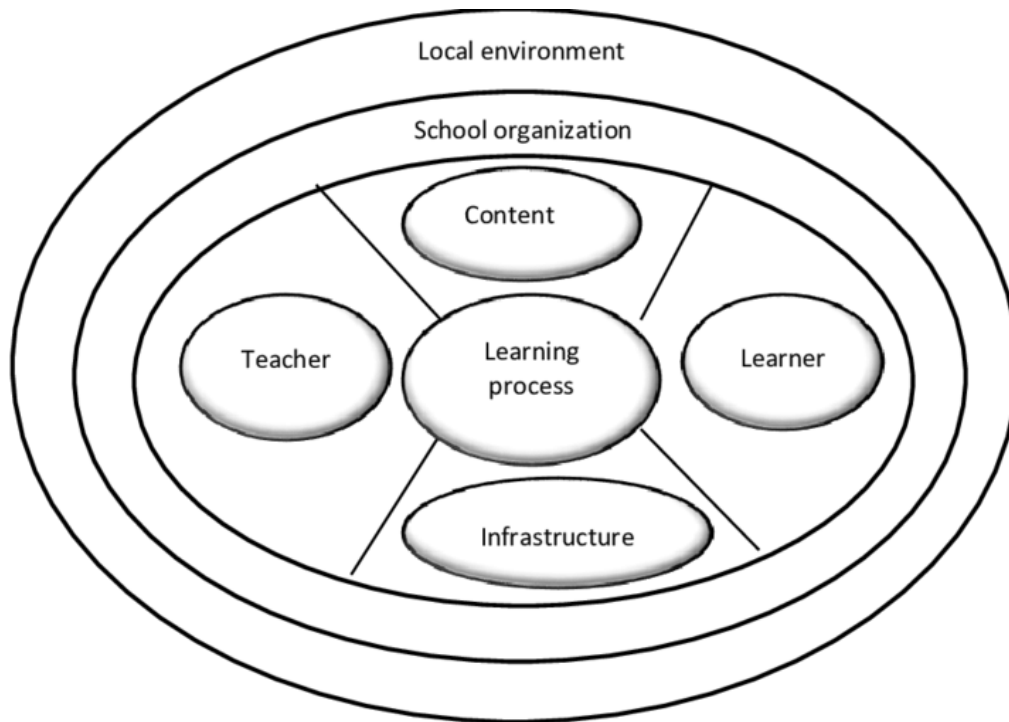
2.1 ICT Infrastructure

The research examined the various aspects of infrastructure such as classrooms, electricity as well as security. For classrooms, the study sought to determine whether they had the requisite specifications, such as being secured with grill windows and doors, having secure storage units for the digital learning devices, proper ventilations, availability of dust proof floors as well as availability of flat, wide desks. For power, the study sought to understand whether there were multiple sources of power and whether there were backup options available. For security, the study sought to explore the various security measures available to ensure security of the DLP devices and infrastructure. The study also sought to determine the likelihood of occurrence of identified risks and how those risks could affect the DLP process.

Even with ICT infrastructure and its applicability in middle and primary schools, a divide still exists between the needs of providing ICT infrastructure and the patterns of promoting ICT application in education (Lu et al, 2015). ICT is an appropriate method of accessing and distributing learning resources in rural areas where ICT infrastructure is present but resources such as libraries and books are scarce (Kuyoro et al, 2015). An inclusive Digital Literacy Framework is crucial for low-literate learners in vulnerable populations living in rural areas with lack of ICT facilities, intermittent electricity and low internet bandwidth (Nedungadi et al, 2018).

Effective leadership can promote the use of Digital Learning Materials by teachers through supporting a school wide learning climate provided that an ICT infrastructure exists (Vermeulen et al, 2017). Technologies and digital media platforms require collaborative inquiry to bring them into the conventional education practice of schools, universities and libraries (Hobbs & Coiro, 2019). More solid support, encouragement and opportunities should be advanced to increase teachers' motivation so as to enhance the quality and level of ICT use in classrooms (Uluyol & Şahin, 2017). To achieve the goal of digital literacy, public private partnership collaboration should be engaged in order to finance the allocation of ICT facilities to institutions.

ICT facilities, electricity failure and the lack of development of a digital literacy programme standard. are some of the major challenges that affect digital literacy (Ukwoma, Iwundu & Iwundu, 2016). The deployment of ICTs and their infrastructure need to consider factors such as the required distance of transmission; the environment where these technologies will be used; the level of security that should be warranted; the prospective future needs and requirements of the system as well as the regulations in place.

Plomp et al., (1996), Voogt & Odenthal, (1997), determined four (4) key elements that influence the

Figure 1: Driving forces of ICT in the learning process (Source: Plomp et al., 1996; Voogt and Odenthal, 1997)

Technology push is a learning process driven by infrastructure and is not dependent on the other three elements(learner, teacher or learning content). It starts with the acquisition of the relevant ICT materials followed by relevant applications that fit into a learning process. The technology push thus assumes that the availability of ICT materials is an important driving force in the push to implement ICT in education. Educational pull, on the other hand, is a learning process led by the demand of the learner, the learning content or the teacher. It therefore excludes infrastructure (Plomp et al., (1996) Voogt & Odenthal, (1997).

2.2 Choice of Digital Devices

This section examines the digital learning devices and their characteristic features. The digital learning devices examined were Learner Digital Devices, Teacher Digital Devices, projectors, braille embossers for learners with special needs and digital wireless servers. The electricity consumption per device was as follows: servers -24w, learner tablets – 10w, teacher laptops -12w. Each device was configured to take at most five (5) hours to be fully charged; with at most eight (8) hours while the devices were new but reduce gradually with time. Among the features tested were the digital devices' user friendliness and ease of use; their link to specific learning goals; ability to support different styles of learning and ability to take into account varying children's interests. The digital learning devices' rank of importance, risks exposed to them and their likelihoods of occurrences were also tested.

Learning materials have evolved from physical library materials such as printed media to mobile devices such as ebooks, laptops and tablets. These materials have changed in formats and delivery

models. The new devices now provide students with full time access to information and recreational learning. These new devices offer more benefits in terms of cost, reduced redundancy, maintenance and robustness. It should be noted, however, that computers are complimentary, not compensatory. Students therefore need to have good traditional literacy skills before they can effectively and efficiently use the new technological devices (Combes, 2019). Mobile learning devices and video lectures have become important, but little is known on the choices of devices used for watching video lectures. (Namuddu & Watts, 2020). Digital learning provides better positive effects on learning outcome and motivation than what traditional teaching does (Lin et al, 2017).

The choice of digital devices is particularly crucial where digital distractions are concerned. A 2015 American college students' survey examining classroom learning distractions occasioned by the use of digital devices for non-class purposes found out that students spent an average of 20.9% of class time while using a digital device for non-class purposes. On average, a student respondent used a digital device 11.43 times for non-class purposes in a typical school day in the year 2015 compared to 10.93 times in the year 2013. (McCoy, 2016).

Digital learning can be categorized into four parts: Digital tools such as smartphones, tablets, desktops and notebooks; Digital teaching materials such as ebooks and digitized data; Digital delivery of the learning activities through the Internet such as satellite broadcasting and intranet; and autonomous learning, where learners engage through digital learning by themselves (Keane, 2012). Employing integrated digital literacy components of science instructional materials can eliminate the issues associated with science teaching. This in turn helps to improve students' scientific, visual and functional digital literacy in addition to being successful in their future lives (Asriza et al, 2018).

The Summer Institute in Digital Literacy (SIDL) developed the Personal Digital Inquiry model of Digital and Media Literacy (PDI-DML) for inquiry and collaborative learning for students and teachers. In this model, teachers and students undergo collaborative inquiry as they discover and wonder, discuss and collaborate, act and create, and analyse and reflect. They access, analyse, create, reflect and act using the power of information and communication. (Hobbs & Coiro, 2019).

Figure 2: Personal Digital Inquiry in Digital and Media Literacy Model (Source: Hobbs & Coiro, 2019)

With the advent of devolution in 2010, the Government of Kenya decided to install infrastructural facilities in primary schools using counties as bases. (ICT Authority, 2020). The counties, through County Directors of Education (CDE's), were expected to play a role especially in the areas of coordination and facilitation of implementation of the DLP. The County Education Board, in consultation with the county government, oversees the pre-primary education including education programmes and early childhood care in the county, management and operation of youth polytechnics, as well as the coordination and monitoring of trainings and education in the county on behalf of the county government and the national government. The board also monitors the implementation of basic education curriculum in the county. (Basic Education Act, 2013).

For the success and continuity of the DigiSchool programme, collaborative efforts are needed amongst all of the programme's implementing partners. Some of the agencies include Ministry of Education, Science and Technology; Ministry of ICT; the ICT Authority; the Office of the Attorney General; Ministry of Industrialisation and Enterprise Development;Kenya Institute of Curriculum Development (KICD), the National Treasury, Kenya Institute of Special Education (KISE), Kenya Power and Rural Development Authority (REA). Private players such as the Kenya National Association of Parents (KNAP), Kenya Publishers Association, Kenya National Union of Teachers (KNUT) and Kenya Primary School Heads Association (KEPSHA) also form part of the technical team.

Majority of Sub-Saharan Africa lacks available, reliable and affordable access to electric power. According to the World Bank's report of 2019 on Electricity Access in sub-Saharan Africa, the rate of access to electricity in Sub-Saharan Africa is significantly lower than what it could be, considering the electric grid footprint and the levels of income. The report places the Sub-Saharan access rate at 43%, which is far lower than the global access rate of 87%. The electricity access rate is far much less in

rural areas of Africa at 25%. With the continued population boom, the report warns that the current number of Africans without access to electricity will continue to rise. This further imposes constraints on adoption of new technologies in sectors such as education. This greatly affects the Sustainable Development Goal number Seven (7) that deals with Universal access to reliable, affordable,modern and sustainable energy.

2.3 Business Continuity Program (BCP)

Business Continuity (BC) is the process of maintaining or resuming business functions in the occurrence of an unforeseen disruption. A Business Continuity Policy (BCP) is a document that outlines how an organization will continue operating in the event of the occurrence of an unplanned disruption. It basically outlines procedures that an organization will fall into in the event of occurrence of a disaster. It contains contingencies for business aspects that might get affected such as human resources, business processes and assets.

The ISO 22301:2019 guideline defines the minimum requirements that should be implemented by institutions to ensure that business operations are not negatively affected when a disruption occurs. It sets the minimum requirements for institutions in establishing effective and sound business continuity management practices. It is applicable to all organizations, regardless of their type, size and nature. A Business Continuity Management System (BCMS) incorporates the following components: a policy; competent people with clearly defined duties and responsibilities as well as management processes relating to policy; planning; operation and implementation; management review; continual improvement; performance assessment; and documented information supporting performance evaluation and operational control.

Disasters such as pandemics, earthquakes, war and fire can disrupt teaching and learning for long. To allow learning and teaching to continue, some organizations have developed business continuity plans in a bid to protect their primary structures and services. Little research has, however, been conducted on how resilience to disruption can be advanced to reduce impacts on learning and teaching in academics, learners as well as communities of practice. There is therefore little data on how these academics, learners as well as communities of practice would respond before, during and after disasters. (Dohaney et al, 2020).

The advent of Covi-19 pandemic in 2020 brought events that were disruptive and life-changing which brought the whole world to a near standstill. Governments of numerous countries imposed lockdowns and movement restrictions, which impacted badly on schools and higher education institutions (Rasiah, Kaur & Guptan, 2020). Learning in public primary schools, which had been done in-person, was greatly affected. The Government of Kenya abruptly closed schools on 15th March 2021, ostensibly to slow down the spread of the disease as well as to buy time to put proper measures to combat the pandemic. This plunged the future of around 17 million learners in jeopardy. The Ministry of education advised

that the learners could continue learning online or using technology-mediated learning on radio, television, mobile phones and ed-tech apps. While this was good advice, it further alienated marginalized and rural learners, especially in public primary schools. This meant learning in all the public primary schools could not continue, let alone the digital literacy program.

In low and middle-income countries, data on the potential role of business continuity in pandemic resilience continues to remain scattered. Business continuity in organizations is mostly driven by organizational agility and pre-existing conditions. The Covid-19 pandemic made it difficult for organizations to continue their operations, due to the financial and operational challenges that ensued, forcing them to downsize and/or shut down their workforce or operations. (Schmid, Raju & Jensen, 2021).

The Board of Directors of an institution is mandated to come up with pandemic preparedness planning policies, procedures, strategies, guidelines and the minimum standards for an institution. (Central Bank of Kenya, 2020).

Dohaney et al (2020) aver that resilient academics should be adaptable, flexible, collaborative, emotionally resilient, empathetic, quickly responsive during a disruption, have digitally literate, prepared, organised and creative thinkers; have open-minded individuals; and have a sound awareness of their courses, their approaches are learner-centred, learning and teaching delivery options during disruptions and emergency protocols. Resilient institutions should have effective communication channels; existing emergency response management and plans; a sound crisis communication strategy; an established, sound, learning & teaching disruption plan across all the institution's levels; resilience-building and strong leadership; existing blended, flexible and digital learning strategies; staff support to undertake resilience-building drives; staff support to develop digital literacy; easy to use and effective digital infrastructure; a strong sense of learner and staff community; as well as existing schemes/rewards that enhance academic and professional development.

SchWeber (2013) argues that technological developments such as e-learning, Skype and text alerts now provide opportunities for educators to apply lessons learnt from business for academic continuity. Available literature on higher education and organizational continuity provides the basis for the argument that education today requires the attention in maintaining academic continuity. Day (2015) defines academic continuity planning as an unfolding tool for dealing with the cancellation of classes due to the threat of pandemics, natural disasters and acts of violence. The author also argues that academic continuity can be associated with less dramatic events such as bad weather, power outages or the temporary unavailability of an instructor, more so if the issue is recurrent.

SPATIAL EXTENT
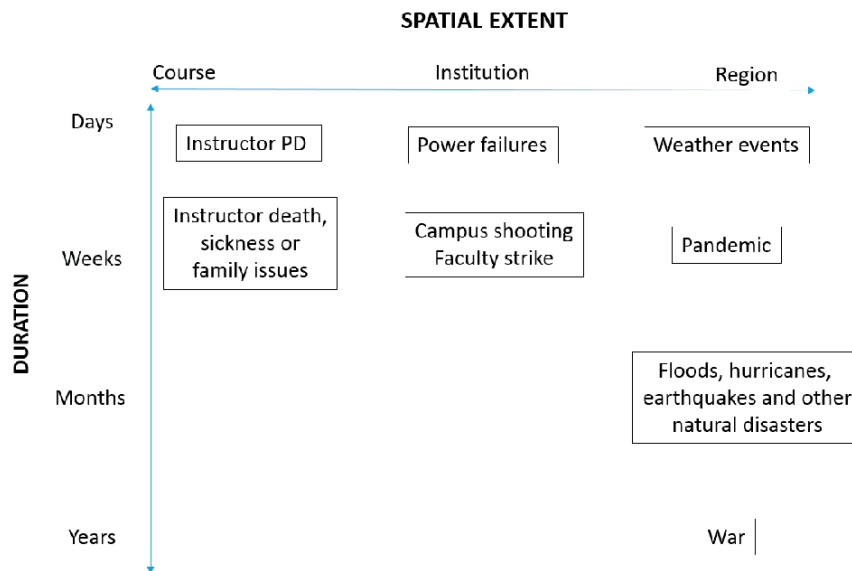
Figure 3: Spatio-temporal relationships of academic continuity issues (Source: Day: 2015)

By using technology (blogs to teach students), educators are eager about using web technologies in their teaching practices. Several concerns such as accessibility to digital content, digital literacy competencies and technology-use behaviour still exist (Al-Qallaf & Al-Mutairi, 2016).

2.4 Towards Digital Literacy

Digital literacy is defined as the ability to access, understand, manage, communicate, integrate, evaluate and create information appropriately and safely using digital technologies for entrepreneurship, employment and decent jobs. It incorporates competences variously referred to as ICT literacy, computer literacy, media literacy and information literacy. (UNESCO, 2018). Leadership, through idealized influence, inspirational motivation has a significant effect on how the DLP is implemented in Kenya. High level support from organized and detail-oriented team members is key to the success of implementation of the DLP (Kipronoh, Iravo & Muchelule, 2020).

Literacy has over the past been viewed from its application to the medium of writing. This view has been recognised by researchers as limiting, and there have thus been attempts to extend this notion. Some researchers recognise the importance of visual and audio-visual media, but still challenge this extension of the term literacy, instead arguing that the definition should continue being confined to the realm of verbal language. Early arguments for computer literacy were basically shallow functional definitions, specifying the basic skills required to perform operations. Over the years, these definitions have improved especially on what computer literacy encompasses.

Shopova (2014), in a study to determine the main role of digital literacy and the students' skills in using new technology in the European Higher Education Area, noted that the development of the literacy levels of students and their digital competence is essential in improving the efficiency and

effectiveness of the learning process. According to the Bulgarian researcher, new media communication technologies and the internet are becoming an unparalleled source of education and a crucial tool for new literacy development. While the study focused on university students, hoping to enable them raise their academic results and to provide them the opportunity to keep abreast with the ever changing demands of work and life, the same could be said of primary school students in Kenya. The students' eventual goal will be to be part of the populace that the Government of Kenya intends to benefit from in its Vision 2030 goals. This includes among others the development of literacy and digital skills for learning and discerning the use of digital media for the learners to meet global competitiveness.

Parents' perceptions of digital technologies is improved by the use of these digital technologies for learning in schools , which helps digital learning in children and supports a more meaningful and healthier use of digital devices. Children of all ages are now making use of the internet at an increasing rate, notably among very young children aged between 0 and 8years. Even preschoolers are now using the internet, while children below 2 years often use the internet using their parents' devices. (European Commission, 2018).

A study conducted by the European Union on boosting children's digital literacy, based on interviews with families across 21 countries noted that parents' attitudes to digital technology shaped the attitudes and learning environment of children, parents saw digital evolution as unavoidable but at the same time very challenging while schools were seen as crucial in promoting the optimal use of digital technologies. The study urged teachers and schools to enhance children's media and digital literacy as early as possible. It also highlighted the significance of developing digital pedagogies and a digital competence curriculum as part of teachers' training.

The European Commission has come up with competence frameworks to allow teachers (DigCompEdu), citizens (DigComp), educational organisations and schools (DigCompOrg) as well as employment and education authorities to improve and assess these skills.

2.4.1 Digital Competence Framework for Educators (DigCompEdu)

This framework provides a general reference point for supporting the development of educator-specific digital competences in Europe. It is geared towards educators at all levels of education, right from early childhood to higher and adult education, including special needs education, vocational and general training and education as well as non-formal learning contexts.
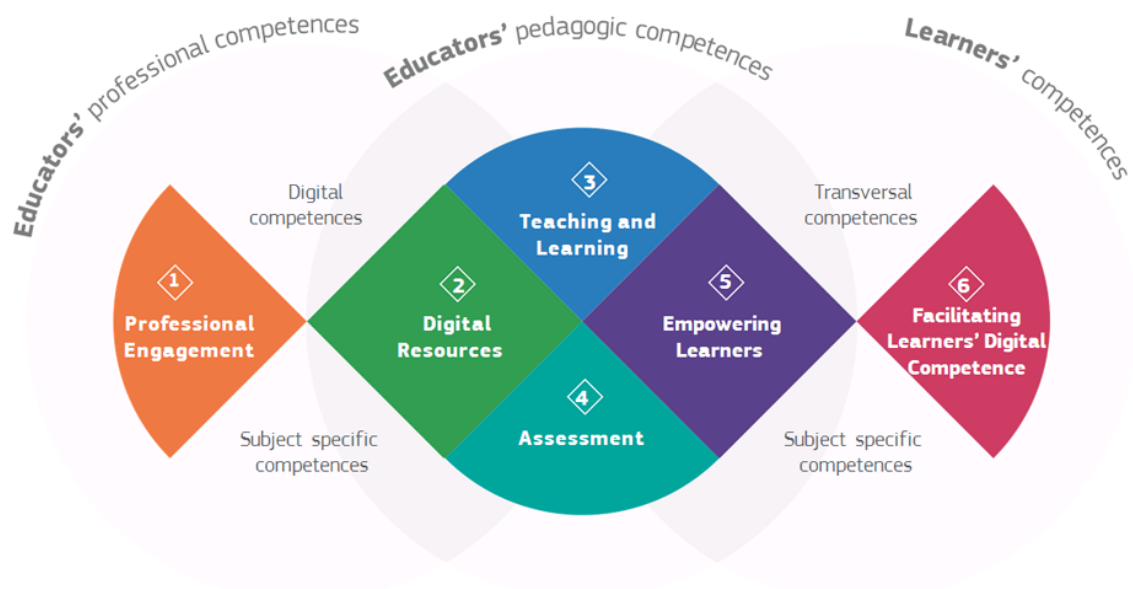
Figure 4: DigCompEdu Framework (Source: Punie, Y., editor(s), Redecker, C., 2017)

2.4.2 Digital Competence Framework for Educational Organisations (DigCompOrg)

This framework can be used by educational institutions such as primary, secondary and VET schools and higher education institutions to guide a self-reflection process on their progress towards effective deployment and comprehensive integration of digital learning technologies. The framework hopes to facilitate comparability and transparency between related initiatives throughout Europe and help address fragmentation and uneven development across the European Member States.
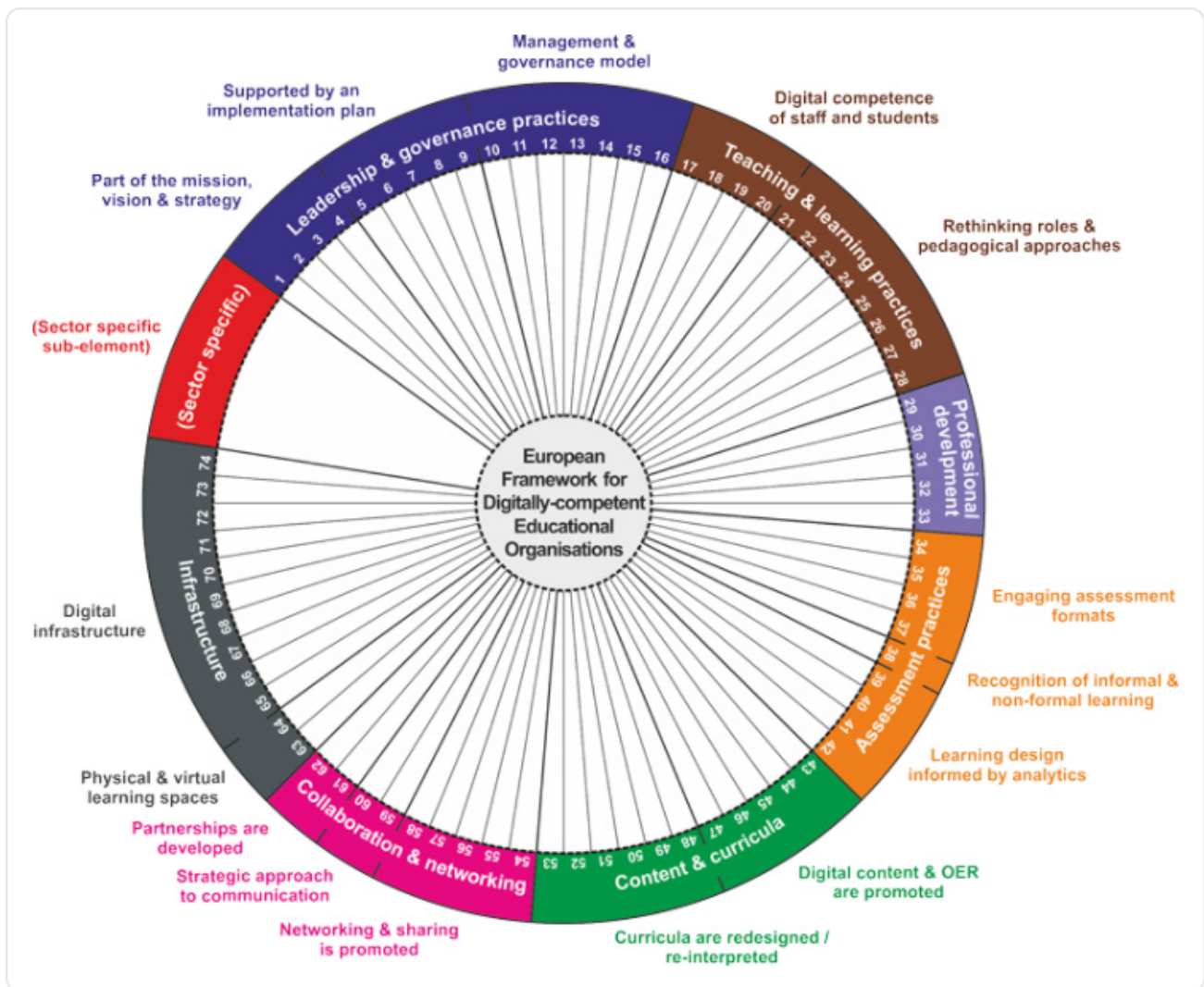
Figure 5: Digital Competence Framework for Educational Organisations (Source: Kampylis, P., Punie, Y. & Devine, J., 2015)

Bekker et al. (2015) conducted a study on how to teach design thinking and digital literacy to children in primary and secondary schools, focusing primarily on exploring the tools that may support the learning of children in these domains. The study provided a Reflective Design-based Learning (RDBL) framework that described the challenges of matching teachers' abilities, developing an integrated process doable at school, appealing for children and fitting to the knowledge presented in the materials of publishers that support learning and teaching goals.

In 2016, the Government of Indonesia launched a program called the Digital Literacy Movement (DLM) program. The program was aimed at improving the digital literacy capabilities of adolescents who were deemed vulnerable to exposure to irresponsible information available on the internet. Lack of basic infrastructure contributed greatly to the slow adoption of the DLM.

CHAPTER 3 – RESEARCH METHODOLOGY

This section provides an overview of the research strategies employed in the study.

3. 1 Conceptual Framework

A conceptual framework makes explicit how a researcher structures their thinking about their research topic and the process undertaken. (Oates, 2006). Several frameworks have been developed over the years. The KSAVE (Knowledge, Skills, Attitudes, Values and Ethics) framework proposed by Binkley et al (2010) explores ten competency skills or areas, grouped into four (4) key categories: Ways of Working (collaboration, communication); Ways of Thinking (critical thinking, creativity and innovation, problem solving, decision making, learning to learn); Tools for Working (ICT literacy, information literacy) and Living in the World (life and career, citizenship, personal and social responsibility). The Reflective Design-based Learning (RDBL) framework by Bekker et al. (2015) framework outlines the web of stakeholders and criteria that should be considered for design-based learning in the classroom, while using technology tools like electronics toolkits.
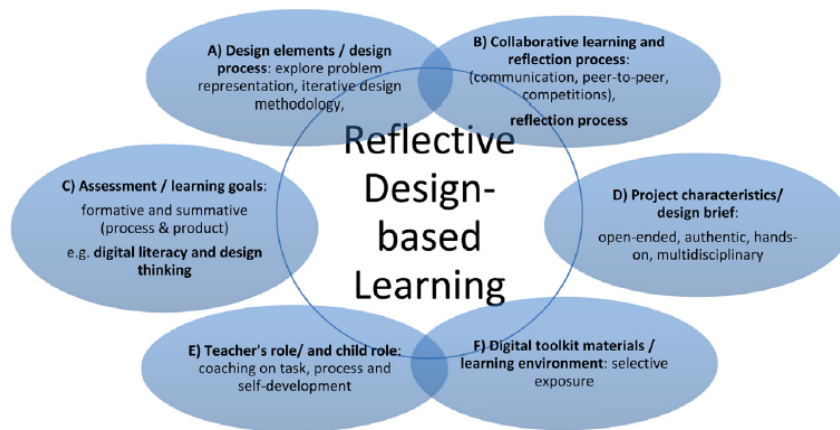
Figure 6: The RDBL Framework (Source: Bekker et al., 2015)

The RDBL framework is made up of the below 6 components:

1. *The elements of a design process (dimension A)*. The reflective design process is a recursive process that combines learning with designing, following steps that support convergent and divergent context of use. It examines open-ended design problems that necessitate the coming up with a good combination of products having specific working principles that have value for the user

2. *Collaborative learning and reflection process (dimension B)*. This design process entails switching between imagining and modelling in the head and confronting reality outside of the head. It describes the employment of a digital portfolio in a learning environment, where children record their reflections and ideas with diverse tools such as voice recording tools, photos and videos.

3. *Learning goals and assessment (dimension C)*. Learning goals can be phrased both in relation to course specific goals and in relation to 21st century skills such as digital literacy and problem solving.

4. *Design brief and project characteristics (dimension D)*. Design briefs need to have an aim that is societally relevant.

5. *Teacher's and children's role (dimension E)*. Children can be interested in technology for various reasons and should therefore be targeted in different ways when providing them with learning activities.

6. *Properties of the learning environment (dimension F)*. Digital toolkits can be used to support children in quickly developing solutions for various issues and hence support digital fabrication.

Research Conceptual Framework

The conceptual framework of this study was adopted from the RDBL Framework. From the RDBL framework, the research focused on the learning environment in terms of the digital toolkit and learning materials (Item F). The third construct (Business Continuity Management) was identified from literature review. The three constructs formed the independent variables for the study, which could affect the implementation of the Digital Literacy Program, and thus have an overall effect on Kenya's Digital Literacy level.
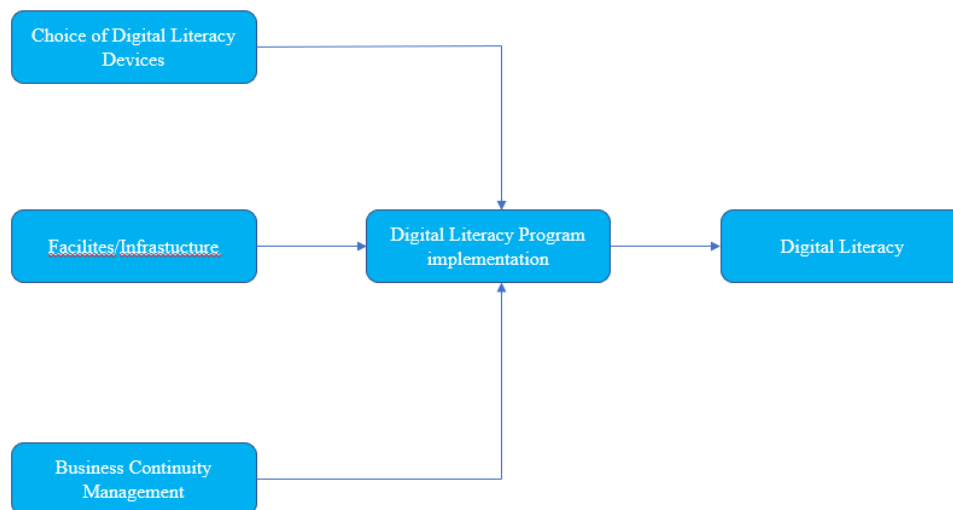
Figure 7: Research Conceptual Model (Source: Research, 2021)

Choice of digital devices

The research examined their user friendliness and ease of use; their link to specific learning goals; ability to support different styles of learning and ability to take into account varying interests children might have.

The research examined the various aspects of infrastructure such as classrooms, electricity as well as security.

Business Continuity

The research examined continuity aspects such as policies, training, resource (human and financial) allocation and general respondents' knowledge of business continuity.

3.2 Research Philosophy

This study adopted the philosophy of positivism since it was based on existing literature on studies done in the field of digital literacy.

3. 3 Research Design

This research used both descriptive and exploratory research designs. A descriptive research was selected in order to study the influence of facilities and choice of digital devices in the implementation of the DLP. The exploratory research design was used to study the challenges and opportunities for the implementation of the DLP.

3.4 Research Method

This study applied the quantitative research method to collect and analyse data on the different aspects of the implementation of the DLP. Mathematical calculations were used to carry out data analysis and draw upon well-established mathematical and statistical procedures.

3. 5 Data Collection

3.5.1 Case Background

This study was conducted on public primary schools in Makueni County, Kenya. The schools were selected from each of the six (6) constituencies of Makueni County, namely: Mbooni, Kaiti, Kilome, Makueni, Kibwezi East and Kibwezi West. In each Constituency, at least two (2) schools were selected.

3.5.2 Sampling Frame and Technique

This study used a purposive sampling targeting only respondents either involved in, with knowledge of or affected by the implementation of the DLP in Makueni County, Kenya. The respondents chosen thus had the requisite experience, knowledge and played day to day roles in the Digital Literacy Program. They included teachers, pupils, headteachers, ministry of Education and ICT officials such as sub-county directors and relevant county government education employees

3.5.3 Target Population

The target population of this study comprised the relevant education stakeholders in Makueni County, Kenya. Below were the participants and their roles:

1. *Headteachers:* Tasked by the ministries of ICT and Education to ensure the smooth running of the DLP process. They were also the figureheads in their schools and so the success or failure of implementation of the DLP in their schools would lie squarely on their shoulders.
2. *Teachers:* Tasked with the actual teaching work. These interacted on a day to day basis with pupils
3. *Pupils:* The main subjects of the DLP process. The researcher sought to gauge their understanding of the DLP and how it impacted their learning.
4. *National Government officials.* These were tasked with enforcing government directives concerning the DLP, and were drawn from the Ministries of Education and ICT.
5. *County Government officials.* Since the research focused on the County of Makueni, county government officials' perspectives were deemed necessary.

Table 1: Questionnaire Sampling Matrix

Population Description	Target Population
Headteachers	14
Teachers	42
Pupils	28
County Government officials	10
National Government officials	20
Total	114

3.5.4 Data collection Methods

The study used both primary and secondary methods of collecting data. Secondary data was obtained from Government policy documents, academic publications, past studies and parastatal websites. Primary data was obtained through interviews and questionnaires.

Interviews

The researcher conducted unstructured personal interviews through a series of meetings with local authorities and institutional heads in the study area. These were mainly to seek the perspectives of the heads and clarify the purpose and nature of the study. Focused interviews were also done with top

County and Government officials with extensive knowledge and experience in legislation, policy making and facilitation of the Digital Literacy Program.

Questionnaires

Structured questionnaires were created based on the research objectives. There were two sets of questionnaires: the adults' and the pupils' questionnaires. The adults' questionnaires tested the constructs of choice of digital devices, facilities and BCP. The questions were either open (i.e., inviting free response) or closed (i.e., of the type 'yes' or 'no'). Likert scale-based questions, where numbers were assigned to the range of responses were used. These were based on a scale of 1 to 5.

3.5.5 Pilot Testing

A pilot study of would-be likely respondents was conducted before the main questionnaire was sent. This was done to test the questionnaire validity, response rate and to minimise bias. Questions were sent to the test group comprising fourteen (14) respondents from the sample population.

3.5.6 Ethical Considerations

The research was conducted within the confines of law; it was legal and ethical. It was conducted within the ethical guidelines of academic research, without breaking the law or causing the researcher and respondents discomfort and/or harm (physical, emotional or social). The research purpose and expectations were clearly communicated to the respondents. Everyone involved in the research was treated fairly and with honesty. Consent was sought from the university, the Government research authorization agency (NACOSTI) as well as the respondents before the research was carried out. Anonymity was maintained in the research.

3.6 Data Analysis

Considerations were made on the respondents, the context and timescale in which documents were produced and the purpose for which the documents were originally created. Government documents were considered with the view that governments did have political purposes in mind and could present findings in ways that served their interests.

The study employed a deductive analysis. The data was grouped based on the study objectives and analysed to provide the status of the implementation of the Digital Literacy Program in Makueni County. IBM SPSS Software, excel and R were used for the analysis of the data obtained, using percentages and frequency counts.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents the study results, data analysis, interpretations as well as discussions of the findings based on the study objectives.

4.1 Questionnaire Return Rate

The study targeted a population size of one hundred and fourteen (114) respondents. The questionnaires were provided in the form of an online form and sent to respondents in various online methods including emails, Teams, Zoom and Whatsapp. The data was collected between May and June 2021. A response rate of 50% is sufficient for analysis and reporting; a rate of 60% is good while a rate of 70% and over is excellent (Mugenda & Mugenda, 2003). Based on the Mugenda & Mugenda (2003) assertions, a response rate of 83% was deemed excellent.

Table 2: Questionnaire Return Rate

Population Description	Target Population	Response	Return Rate
Headteachers	14	14	100%
Pupils	28	25	89%
Teachers	42	32	76%
County Government officials	10	6	60%
National Government officials	20	18	90%
Total	**114**	**95**	**83%**

4.2 Respondents' Demographic Analysis

The study employed descriptive statistics to describe, compare and analyse data through measures of central tendency (i.e, mean, mode and median) and dispersion (standard deviation). The demographic information of the respondents included the respondent's individual gender, level of education, age bracket, job function, working experience, level of proficiency and professional qualification. The respondents' institutions information such as the operational areas, people employed, and institution types was also captured. The respondents' demographic information was, however, not a subject of study.

Respondents' Gender

55.9% of the respondents interviewed were male while 44.1% were female.

Academic Qualifications of Respondents

The researcher sought to investigate the respondents' academic qualifications. The highest level of professional qualification which dominated the respondents' sample was that of those with a Diploma, accounting for 35.7% of the population sample, followed closely by Degree (31.4%). This meant that

the respondents were qualified to effectively administer and/or respond to questions on the Digital Literacy Program.

Age Distribution of Respondents

The respondents were grouped into pupils and adults. 50% of the respondents were aged between 40-50 years, followed by those aged between 30-40 years at 32.9%. The least were those aged between 19-30 years (4.3%). The pupils were all below 18 years hence their age bracket was not tested as it was not considered an important factor of study.

Participants Primary Job Function

Participants were grouped according to their roles in their institutions. Majority of the respondents (45.7%) were teachers followed by headteachers at 20%. These respondents were, therefore, directly involved in the Digital Literacy Program and had the requisite knowledge of the Digital Literacy Program.

Working Experience of the Respondents

The respondents were requested to indicate their working experience. Majority (54.3%) of the respondents had worked for over 10 years, followed by those who had worked for 6-10 years (21.4%) and 3-5 years (20%). This meant that they had the requisite experience in their professions and were therefore a good target population.

Participants Proficiency of the Digital Literacy Program

The respondents were requested to state how well versed they were with the Digital Literacy Program. Majority (54.3%) of the respondents stated that they had an intermediate level of knowledge of the Digital Literacy Program, followed by those with basic knowledge at 32.9%. This could be construed to mean that more training could be required to be administered to elevate the level of knowledge, more so on those who were involved in the day to day running of the Digital Literacy Program, such as teachers.

Participants Organizations

The respondents were requested to state their places of work.Majority (75.4%) of the respondents were from public primary schools, followed by those from the County Government at 10.1%.

Participants' Organizations' Number of Employees

The researcher sought to investigate the number of employees in the respondents' institutions. Majority of the respondents (68.1%) were from institutions with less than 100 employees.

Respondents' Organizations' Geographical Operational Area

The researcher sought to understand where the institutions of the respondents operated.Majority of the respondents (59.4%) were from institutions that operated at local levels, followed by those that operated at regional levels at 21.7%.

4.3 ICT Facilities/Infrastructure

The respondents were requested to indicate whether the below aspects of facilities existed within their areas of jurisdictions:

Table 3: Availability of ICT Facilities Analysis

Availability of stable power supply (electricity or solar)	73.2% agreed
Availability of classrooms secured with grill windows and doors	57.1% agreed
Availability of secure storage units for the learning devices	76.8% agreed
Proper ventilation of classrooms and storage units	75% agreed
Availability of dustproof floors	74.5% disagreed
Availability of flat, wide desks	69.6% disagreed

Likelihood of Occurrence Determination (LOD)

This section sought to test how likely risks that could affect the Digital Literacy Program facilities were likely to occur. The respondents were requested to indicate which of the below risks were more likely to occur and thus affect the ICT infrastructure running the DLP.

Table 4: Risk Likelihood of Occurrence Analysis

Instructor death, sickness or family issue	68.6% indicated it's possible
Power failures	68.6% indicated it's likely
School unrest	44.3% indicated it's possible
Weather events	51.4% indicated it's possible
Natural disasters eg floods, earthquakes	44.3% indicated it's possible
War	42.9% indicated it's possible
Rodents and pests	54.3% indicated it's possible

Using a scale of low to high, the respondents were requested to rate the likely impact of the listed risks.

Table 5: Risk Likely Impact Analysis

Instructor death, sickness or family issue	59.7% indicated low impact
Power failures	67.2% indicated high impact
School unrest	50% indicated medium impact
Weather events	62.1% indicated medium impact
Natural disasters eg floods, earthquakes	37.9% indicated high impact
War	60.3% indicated low impact
Rodents and pests	60.1% indicated medium impact

Other aspects of facilities tested included:

Table 6: Other DLP Facilities Analysis

Availability of multiple sources for raw power available	83.6% indicated No
Availability of a stand-by UPS which can take over in the event of failure of primary power connection	90.9% indicated No
Whether the access to buildings hosting DLP equipment was restricted to authorized personnel only	66.7% indicated Yes
Whether there was any asset tracking procedure in place (movement of asset inside and outside the learning facilities)	69.1% indicated No
Whether the entry points to the facilities were manned all the time	63.6% indicated No
Whether the institutions had good network coverage	58.2% said No
The internet connection the institutions used	48.3% said None

4.4 Choice of Digital Devices for the Digital Literacy Program

This section sought to determine the influence of the choice of digital devices on the whole digital learning process.

The respondents were requested to indicate the extent to which they agreed or disagreed with each of the statements made, on a scale of 1 to 5, where {1-Strongly Disagree} {2--Disagree} {3-Neutral} {4-Agree} {5-Strongly Agree}. The statements presented were to test:

Table 7: DLP Devices Characteristic Analysis

Whether the DLP devices were easy to use and user friendly	62.9% agreed
Whether the DLP devices accommodated specific learning goals	68.6% agreed
Whether the DLP devices could support different styles of learning	65.7% agreed
Whether the DLP devices could consider varying children interests	68.6% agreed

Whether the choice of digital devices influenced the implementation of DLP	40% agreed

Asset Class Importance (ACI)

This is a measure of an asset's importance based on its criticality. Values were assigned as shown below:

Classes	Score	Criteria
High	3	Unavailability of asset will result to interruption of the whole learning process
Medium	2	Unavailability of asset will result to interruption of minor part of the learning process
Low	1	Unavailability of asset will result to insignificant impact to the learning business

Respondents were requested to rate each of the below DLP devices based on their view on their importance to the success, or its lack thereof, of the DLP program.

Table 8: DLP Devices Asset Class Importance Analysis

Learner Digital Device (LDD) & Projector	80% termed it high
Teacher Digital Device (TDD)-	62.9% termed it medium
Braille Embosser	61.4% termed it low
Digital Content Server	60% termed it high
Wireless Router	54.3% termed it high
Network Devices- UPS (Uninterruptible Power Supply	45.7% termed them high
Laptop	44.3% termed it high
Desktop	41.4% termed it medium

Likelihood of Occurrence Determination (LOD)

This is a measure of how an asset is susceptible to a threat. Values were assigned to the likelihood of occurrence of threats as below:

Classes	%	Criteria
Almost Certain	>75%	The risk is common and repetitive; it is almost certain to occur
Likely	50%-75%	There is more than an even chance of occurring
Possible	25%-50%	There is a history of occurrence of the risk thus the risk event may occur
Unlikely	10%-25%	There has been limited history of occurrences of the risk hence risk occurrence is improbable
Rare	<10%	The risk event is not expected to happen. There has been no previous report of occurrences.

The respondents were requested to rate the likelihood of occurrence of the below risks:

Table 9: DLP Devices Risk Likelihood of Occurrence Analysis

Breakdown of DLP devices	54.5% termed it likely
Physical Intrusion /Loss/theft	52.7% termed it likely
Failure of Application Software	49.1% termed it likely
Failure of environmental controls (humidity, temperature)	50.9% termed it likely
Loss or absence of personnel	42.6% termed it likely
Malicious Code	45.5% termed it possible
Utilities failure eg power	55.6% termed it likely
Inaccessibility of premises due to social unrest/curfew etc	40% termed it possible

Control Effectiveness (CE)

This is a measure of the measures put in place to ensure that the DLP devices were working/available as expected. Values were assigned as below:

Classes	Score	Criteria
Unsatisfactory	3	Control measures are ineffective and there are major deficiencies
Partially Satisfactory	2	Some of the risk exposure appears to be controlled but there is room for improvement
Satisfactory	1	Majority of risk exposure is controlled

Respondents were requested to rate each of the below control measures put in place by the Ministry to ensure that the DLP devices were working/available as expected.

Table 10: DLP Devices Control Effectiveness Analysis

Insurance of digital learning devices	55.9% termed it unsatisfactory
Replacement of faulty digital learning devices	48.5% termed it partially unsatisfactory
Repair of faulty digital learning devices	52.2% termed it partially unsatisfactory
Call Center Support for digital learning	53% termed it partially unsatisfactory
Availability of a learning device for each pupil	66.2% termed it unsatisfactory

4.5 Business Continuity Management (BCM) Survey

The study sought to understand measures taken or those that should have been taken to address continuity of the Digital Learning Program, especially with the Covid-19 Outbreak. Respondents were asked questions on the various aspects of BCM. The questions and their respective results are shown below:

Table 11: Business Continuity Survey Analysis

Whether the respondents were aware of the existence of a Business Continuity Management Policy in their institution	52.9% said No
If Yes to the above question, for how long the Business Continuity Management Policy had been in place their institution	78% said Not Sure
Whether there were at least three (3) trained teachers trained for the Digital Literacy Program in their institution	82.1% Said Yes
Whether the respondents' organizations maintained and fostered relationships with the relevant external government agencies to ensure continuity of your organization activities in case of a disaster	70.1% Said Yes
Whether there was a Business Continuity Management Team with authority and defined roles and responsibilities to act in the event of occurrence of a major disruption	52.2% Said Not Sure
Whether employees were trained and made aware of their roles in the implementation of the Business Continuity Management	47.8% said Not Sure
Whether adequate human and financial resources were made available to provide support for Business Continuity Management	56.7% said Not Sure
The primary reasons that the respondents' organizations had established a Business Continuity Management Program	58.8% said Government Regulation
How the respondents' organizations measured the performance of their Business Continuity Management Program	73.5% Said Not Applicable

Since Covid-19 Outbreak

In light of the Covid-19 Outbreak, during which the study was carried, the respondents were asked whether:

Table 12: Business Continuity Since Covid-19 Outbreak Analysis

Their Organization had reviewed its Business Continuity Management Policy	63.6% said Not Sure
Their Organizations had tested their Business Continuity Management Policy-	62.1% said Not Sure
Their Organizations had Conducted Business Continuity Management Training for their Employees	53.7% said Not Sure
Whether their Organizations had updated Emergency Contact Information	52.2% said Not Sure
The incident(s) the respondents' organizations had experienced in the past year that could make business continuity plans worth considering	72.3% quoted Pandemics

The most recent interruption that had required the respondents' organizations to activate one or more business continuity plans	56.1% said they could not tell

4.6 Pupils' Questionnaire

The pupils were asked simple questions to gauge their understanding and perspective of the Digital Literacy Program as a whole.

Table 13: Pupils' Questionnaire Analysis

When did you lastly learn with the Digital Literacy Program Devices?	52% said they could not remember
Do you know how to operate the Digital Literacy Program Devices?	60% said No
Have you operated the Digital Literacy Program Devices before?	60% said Yes
If you were allowed to carry the Literacy Program Devices home, would you be able to learn at home?	64% said No
Do you know any other Digital Literacy Devices other than the ones you are taught with?	60% said No
Do you enjoy interacting with the Digital Literacy Devices?	58.3% said Yes

4.7 Key Results and Discussion Points

4.7.1 ICT Facilities

The respondents confirmed the following aspects of facilities: 73.2% confirmed that their areas of jurisdictions had stable power supply (electricity or solar); 57.1% confirmed that they had classrooms secured with grill doors and windows; 76.8% confirmed that they had secure storage units for the learning devices ; while 75% confirmed that they had proper ventilation of classrooms and storage units. However, 74.5% of the respondents stated they did not have dustproof floors while 69.6% did not have flat, wide desks. For effective learning, institutions need to have basic infrastructure, which in this case should include dustproof floors and flat, wide desks for pupils.

Of the risks identified that could affect the implementation of the Digital Literacy Program, power failures were found to be the most likely to occur, with 68.6% of the respondents indicating the risks were likely. The other risks were all possible, as confirmed by the respondents in their tally: Instructor death, sickness or family issue (confirmed by 68.6% of the respondents); School unrest (confirmed by 44.3% of the respondents); Weather events (confirmed by 51.4% of the respondents); Natural disasters eg floods, earthquakes (confirmed by 44.3% of the respondents); War (confirmed by 42.9% of the respondents) and Rodents and pests (confirmed by 54.3% of the respondents).

Of the risks identified, power failures (indicated by 67.2% of the respondents) and natural disasters

(indicated by 37.9% of the respondents) were found to have high impact on the Digital Literacy Program. School unrest, Weather events and Rodents and pests were found to have medium impact, as indicated by 50%, 62.1% and 60.1% of the respondents respectively. Instructor death, sickness or family issues and war were found to have low impact, as indicated by 59.7% and 60.3% of the respondents respectively.

Results of the other aspects of facilities tested indicated that there were no multiple sources for raw power available as well as stand-by UPS to take over in the event of failure of primary power connection. These were indicated by 83.6% and 90.9% of the respondents respectively. Access to buildings hosting DLP equipment was restricted to authorized personnel only. This was indicated by 66.7% of the respondents. There was not any asset tracking procedure in place (movement of assets inside and outside the learning facilities), as indicated by 69.1% of the respondents. The entry points to the facilities were not manned always (24hours a day, 7 days a week), as indicated by 63.6% of the respondents. 58.2% of the respondents indicated that their institutions did not have good network coverage. 48.3% of the respondents indicated that their institutions did not have internet connection.

A number of schools reported theft of some Digital Literacy Program learning devices, more so the learner digital devices, the digital content servers and projectors. There was a wave of thefts which occurred across the county. This could be attributed to the fact that there were no asset tracking procedures in place and the entry points to facilities hosting DLP devices not being manned always.

4.7.2 The choice of Digital Learning Devices

Results showed that the DLP devices were easy to use and user friendly (as indicated by 62.9% of the respondents), DLP devices could accommodate specific learning goals (as indicated by 68.6% of the respondents), the DLP devices could support different styles of learning (as indicated by 65.7% of the respondents) and the DLP devices could take into account varying children interests (as indicated by 68.6% of the respondents). The choice of digital devices was found to have an effect on the implementation of DLP. This was indicated by 40% of the respondents.

On assets class importance, results indicated that the devices of high importance were the Learner Digital Device (LDD) (as indicated by 80% of the respondents), Projector (as indicated by 80% of the respondents), Digital Content Server (as indicated by 60% of the respondents), Wireless Router (as indicated by 53.4% of the respondents), Network Devices such as UPS (as indicated by 45.7% of the respondents), and laptops (as indicated by 44.3% of the respondents). Teacher Digital Device (TDD) and desktops were found to have medium importance. These were indicated by 62.9% and 41.4% of the respondents respectively. Braille Embossers were found to be of low importance, as indicated by 61.4% of the respondents.

On the likelihood of occurrence of risks identified by the researcher, results showed that the majority of the risks were likely to occur. These risks were Breakdown of DLP devices (indicated by 54.5% of the respondents), Physical Intrusion /Loss/theft (indicated by 52.7% of the respondents), Failure of Application Software (indicated by 49.1% of the respondents), Failure of environmental controls (humidity, temperature) (indicated by 50.9% of the respondents), Loss or absence of personnel (indicated by 42.6% of the respondents) and Utilities failure eg power (indicated by 55.6% of the respondents). The risks of Malicious Code and Inaccessibility of premises due to social unrest/curfew etc. were found to be possible, as indicated by 45.5% and 40% of the respondents respectively.

On the mentioned control measures put in place by the Ministry to ensure that the DLP devices were working/available as expected, results indicated that most of the measures put in place were partially satisfactory. These measures included Replacement of faulty digital learning devices (as indicated by 48.5% of the respondents), Repair of faulty digital learning devices (as indicated by 52.2% of the respondents), and Call Center Support for digital learning (as indicated by 53% of the respondents). Insurance of digital learning devices and Availability of a learning device for each pupil were found to be unsatisfactory. These statistics were indicated by 55.9% and 66.2% of the respondents respectively.

4.7.3 Business Continuity Management

Results showed that the majority of the respondents were not well acquainted with the concept. 52.9% of the respondents were not aware of the existence of a Business Continuity Management Policy in their institutions. Even for those few who were aware of BCM, 78% were not sure for how long the Business Continuity Management Policy had been in place at their institutions. Resource wise, there were at least three (3) trained teachers trained for the Digital Literacy Program in institutions covered, as indicated by 82.1% of the respondents. The respondents' organizations were found to have maintained and fostered relationships with the relevant external government agencies to ensure continuity of their organizations' activities in case of a disaster, as indicated by 70.1% of the respondents. Majority of the respondents were not sure whether there was a Business Continuity Management Team with defined roles, responsibilities and authority to act in the occurrence of a significant disruption, Whether employees were trained and enlightened on their roles in the Business Continuity Plan implementation and Whether there enough human and financial resources were made available to support Business Continuity Management. These statistics were indicated by 52.2%, 47.8% and 56.7% of the respondents respectively. For respondents aware of BCM, the majority (58.8%) of them stated that the primary reasons that their organizations had established a Business Continuity Management Program was due to Government Regulation.A majority of the respondents (73.5%) could not state how their organizations measured the performance of their Business Continuity Management Program, and if the measures were done, if any.

In light of the Covid-19 Outbreak, during which the study was carried out, the researcher sought to understand the various measures of BCM that respondents' institutions had taken. Results showed that the majority of the respondents were not sure whether their organizations had reviewed or tested their Business Continuity Management Policy. These were indicated by 63.6% and 62.1% of the respondents respectively. 53.7% of the respondents were not sure whether their organizations had conducted Business Continuity Management Trainings for their Employees. 52.2% of the respondents were also not sure whether their organizations had updated Emergency Contacts.

For respondents aware of BCM in their organizations, 72.3% quoted Pandemics as the major incident(s) their organizations had experienced in the past year that could make business continuity plans worth considering. 56.1% of the respondents could not tell the most recent interruption that had required their organizations to activate one or more business continuity plans.

4.7.4 Pupils' Perspective

From the pupils' questionnaires, 60% of the pupil respondents confirmed they did not know how to operate the Digital Literacy Program Devices, while a further 60% confirmed they had not operated the Digital Literacy Program Devices before. 64% of the pupil respondents said they would not be able to learn while at home, even if they were allowed to carry the Literacy Program Devices home with them. 60% of the pupil respondents said they did not know any other Digital Literacy Devices other than the ones they were introduced to. 53.8% of the pupil respondents said they, however, enjoyed learning with the Digital Literacy Devices

Table 14: Combined DLP Facilities Analysis

	vars	n	mean	sd	min	max	range	se
geographical_description	1	69	0.6086957	0.8263561	0	3	3	0.0994816
stable_power_supply	2	56	0.7321429	0.4468505	0	1	1	0.0597129
secure_classrooms	3	56	0.5714286	0.4993502	0	1	1	0.0667285
secure_storage	4	56	0.7678571	0.4260205	0	1	1	0.0569294
ventilated_classrooms	5	56	0.7500000	0.4369314	0	1	1	0.0583874
dustproof_floors	6	55	0.2545455	0.4396203	0	1	1	0.0592784
flat_wide_desks	7	56	0.3035714	0.4639609	0	1	1	0.0619994
instructor_death	8	70	2.8857143	0.8604491	1	5	4	0.1028433
powe_failure	9	70	2.1428571	0.8037181	1	5	4	0.0960627
school_unrest	10	70	3.1285714	0.9467171	1	5	4	0.1131543
adverse_weather	11	70	2.6714286	0.8800762	1	5	4	0.1051892
natural_disaster	12	70	2.8285714	1.0897604	1	5	4	0.1302513
war	13	70	3.2714286	0.9915795	1	5	4	0.1185164
rodents_._pests	14	70	2.7142857	0.9501008	1	5	4	0.1135588
Of.the.above.risks..kindly.rate	15	57	2.3684211	0.8373338	1	3	2	0.1109076
Of.the.above.risks..kindly.ra_1	16	58	1.3965517	0.6195543	1	3	2	0.0813515
Of.the.above.risks..kindly.ra_2	17	58	2.0862069	0.7079618	1	3	2	0.0929599
Of.the.above.risks..kindly.ra_3	18	58	2.0689655	0.6173534	1	3	2	0.0810625
Of.the.above.risks..kindly.ra_4	19	58	1.9137931	0.8225865	1	3	2	0.1080109
Of.the.above.risks..kindly.ra_5	20	58	2.3275862	0.8863078	1	3	2	0.1163779
Of.the.above.risks..kindly.ra_6	21	57	1.9824561	0.6121166	1	3	2	0.0810768
multiple_power.sources	22	55	1.1636364	0.3733550	1	2	1	0.0503432
stand_by_UPS	23	55	1.0909091	0.2901294	1	2	1	0.0391210
DLP_restriction	24	54	1.6111111	0.5961090	0	2	2	0.0811202
asset_tracking_procedure	25	55	1.0181818	0.5607835	0	2	2	0.0756160
entry_points.manned	26	55	1.2545455	0.5517038	0	2	2	0.0743917
good_network_coverage	27	55	1.3454545	0.5517038	0	2	2	0.0743917
internet_connection_used	28	58	5.8448276	2.4408923	1	8	7	0.3205049

Table 15: Combined DLP Devices Analysis

	vars	n	mean	sd	min	max	range	se
DLP_agreement.level	1	48	4.000000	0.5052912	1	5	4	0.0729325
DLP_agreement.level_1	2	70	3.742857	0.7553810	1	5	4	0.0902853
DLP_agreement.level_2	3	70	3.757143	0.8064184	1	5	4	0.0963854
DLP_agreement.level_3	4	70	3.700000	0.7680202	1	5	4	0.0917960
DLP_agreement.level_4	5	70	3.314286	1.1861869	1	5	4	0.1417765
Learner_Digital_device	6	70	2.742857	0.5565347	1	3	2	0.0665186
teacher_digital_device	7	70	2.200000	0.5798551	1	3	2	0.0693059
braille_embosser	8	70	1.614286	0.8391310	1	3	2	0.1002953
digital_content_server	9	70	2.485714	0.6966349	1	3	2	0.0832638
wireless_router	10	70	2.342857	0.7964726	1	3	2	0.0951967
network_device	11	70	2.214286	0.8145926	1	3	2	0.0973624
laptop	12	70	2.314286	0.6924616	1	3	2	0.0827650
desktop.computer	13	70	2.128571	0.7598899	1	3	2	0.0908242
LOD_DLP_breakdown	14	55	3.581818	0.8094559	1	5	4	0.1091470
LOD_theft	15	55	3.600000	0.9148973	1	5	4	0.1233647
LOD_software_failure	16	55	3.600000	0.9349193	1	5	4	0.1260645
LOD_environmental	17	55	3.309091	1.0340988	1	5	4	0.1394378
LOD_personnel.absence	18	54	3.481482	1.0231424	1	5	4	0.1392320
LOD_malicious._code	19	55	3.218182	0.9754564	1	5	4	0.1315305
LOD_utlity_failure	20	54	3.777778	0.8831049	1	5	4	0.1201754
LOD_social.unrest	21	55	3.163636	1.0674240	1	5	4	0.1439314
insurance_digital_learning	22	68	2.455882	0.6787571	1	3	2	0.0823114
replacement_faulty_devices	23	68	2.279412	0.6656965	1	3	2	0.0807276
repair_faulty_devices	24	67	2.238806	0.6534188	1	3	2	0.0798278
call_center_support	25	66	2.287879	0.6267168	1	3	2	0.0771435
learning_device_availability	26	68	2.544118	0.7004012	1	3	2	0.0849361

Table 16: Combined BCM Analysis

	vars	n	mean	sd	min	max	range	se
BCM_existence	1	68	1.941177	0.6885493	1	3	2	0.0834989
duration_BCMP	2	14	3.428571	1.3985864	1	5	4	0.3737879
at_least_3_DLP.trained_teachers	3	56	2.750000	0.5799687	1	3	2	0.0775016
external_agencies_relationship	4	67	2.477612	0.8413231	1	3	2	0.1027840
BCM_team	5	67	1.641791	0.7528027	1	3	2	0.0919695
BCP_roles	6	67	1.716418	0.7747134	1	3	2	0.0946463
BCM_resources	7	67	1.522388	0.6596190	1	3	2	0.0805853
BCMP_reasons	8	68	2.926471	1.6236698	1	6	5	0.1968989
BCMP_measure	9	59	1.305085	0.7486594	1	4	3	0.0974672
Has.Your.Organization.Reviewed	10	24	1.541667	0.5089774	1	2	1	0.1038946
BCMP_review	11	66	1.500000	0.7071068	1	3	2	0.0870388
BCMP_test	12	67	1.686567	0.8203649	1	3	2	0.1002235
BCMP_training	13	67	1.686567	0.8016830	1	3	2	0.0979412
recent_incidences	14	38	4.605263	0.9164996	3	7	4	0.1486759
recent_BCP._activations	15	63	4.936508	1.3425183	2	6	4	0.1691414

CHAPTER 5: RECOMMENDATION AND CONCLUSION

5.1 Research Achievements

Objective 1: Examine the choice of digital devices used in the DLP Program and their effect in the implementation of DLP

The DLP devices were found to be easy to use and user friendly, could accommodate specific learning goals, could support different styles of learning and could take into account varying children's interests. The digital learning devices were found to be highly susceptible to risks such as breakdown, loss and theft. The choice of digital learning devices thus had an impact on the overall implementation of the digital learning program implementation.

Objective 2: Determine the influence of facilities on the implementation of DLP

Of the facilities under study, stable power supply, classrooms secured with grill doors and windows, secure storage units for the learning devices and proper ventilation of classrooms were found to be satisfactory. However, dustproof floors and flat, wide desks were found to be unsatisfactory. The facilities were susceptible to risks such as power failures and natural disasters. These risks, coupled by lack of compensating controls such as lack of multiple sources for raw power, lack of asset tracking procedures, lack of good network coverage and lack of good network connection, contributed greatly to the slow implementation of the Digital Learning Program.

Objective 3: Assess the Business Continuity Plan of the DLP program

Business Continuity Management was found to be unsatisfactorily employed. Even a year and half after the onset of the Covid-19 pandemic, the majority of the education stakeholders were not well acquainted with the concept.

5.2 Emerging Challenges, Opportunities and Issues

The main challenges that the research found, and which had hampered full implementation of the Digital Literacy Program include the following:

1. Lack of enough digital learning devices for all the pupils. For effective learning, each pupil should have a digital learning device assigned to them.
2. Conflict between the old curriculum, which was rank based and the new curriculum (Competency Based Curriculum) in addressing digital literacy.
3. Lack of enough training of personnel. There had been few refresher training sessions for teachers and headteachers to advance their ICT skills.
4. Network coverage issue. Some schools did not have good network coverage. This hampered teaching as it was difficult to tether from whichever devices were available such as mobile phones

5. Lack of internet connection. A huge majority of the schools covered under the study did not have internet connection. The few that had were from pulling together resources to get modems.

6. Negativity of the digital literacy program. As at the time of the study, there were stakeholders who still thought that the DLP program was a political program, promised at the height of an electioneering program and was thus bound to fail

7. Lack of enough funds for the maintenance of the program. There was no kitty for essentials such as internet provision

Despite the challenges encountered, opportunities were identified in the course of the study. They include the following:

1. Collaboration amongst the various education bodies, communities and the private sector. The Government could partner more with Telkos, Internet Service Providers (ISP's) and ICT training centers to provide the much-needed network and internet connection to schools as well as offer trainings to the relevant DLP implementation stakeholders

2. The learners could be allowed to carry the digital learning devices at home. This would, however, require a well thought out working formula to address issues such as loss and theft of the devices while in the custody of the pupils

3. Popularization of the DLP program. The Government could partner with the private sector, special interest groups and other international bodies to popularize the program. This would remove the notion of the program being a political program but rather a program tailored towards achieving the Vision 2030 of a digitally empowered society.

5.3 Recommendations

5.3.1 Facilities

The research recommends the following strategies:

1. For effective learning, institutions need to have basic infrastructure. The research found that dustproof floors and flat, wide desks for pupils were rated as inadequate by most respondents.

2. Risks most likely to occur and have adverse effects to the overall implementation of the DLP should be remediated for effective learning. On top of the list were power failures.

3. Multiple sources of power should be availed to ensure continuous flow of learning.

4. Standby generators and/or UPS's should be availed in schools

5. There should be an asset tracking procedure in place to check movement of assets inside and outside the learning facilities.

6. To ensure safety of digital learning devices, the entry points to the facilities hosting the digital learning devices should be manned always (24hours a day, 7 days a week).

7. The government should increase network coverage and internet connection to schools

### 5.3.2 The choice of Digital Learning Devices

The research recommends the following strategies:

1. For effective teaching and learning, devices of high importance should be availed. These include a Learner Digital Device (LDD for each pupil, a projector, Digital Content Server and Network Devices such as UPS.
2. Risks likely to occur should be mitigated. A risk register outlining the main risks and a risk plan should be drawn and addressed.
3. The ministries of education and ICT should ensure that primary schools education stakeholders are aware of where they can get assistance on DLP issues, such as Replacement of faulty digital learning devices, Repair of faulty digital learning devices and Call Centre Support for digital learning.
4. The ministries of education and ICT should ensure availability of a learning device for each pupil

5.3.3 Business Continuity Management

The research recommends a framework DLP BCM framework consisting of six (6) key tenets:

1. Management Support. The management of various stakeholder institutions should be committed and involved in the implementation of BCM programs.
2. Implementation of BCM Policies. This should be done fully and continuously, through reviews, updates and testing.
3. Capacity Management. Resources (both human and financial) should be provided. There should be BCM teams fully constituted with defined roles and responsibilities. The Ministries of Education and ICT should train more teachers in DLP and allocate more financial resources to the DLP.
4. Collaboration of BCM Stakeholders. The relevant government ministries should collaborate, maintain and foster working relationships to ensure continuity of the DLP.
5. Popularization of BCM Policies and Procedures. The Ministries of Education and ICT should carry out extensive popularization of their BCM policy. This will ensure their staff are well acquainted with the concept of BCM.
6. Continual Improvement. These should be done through audits and self-reviews.
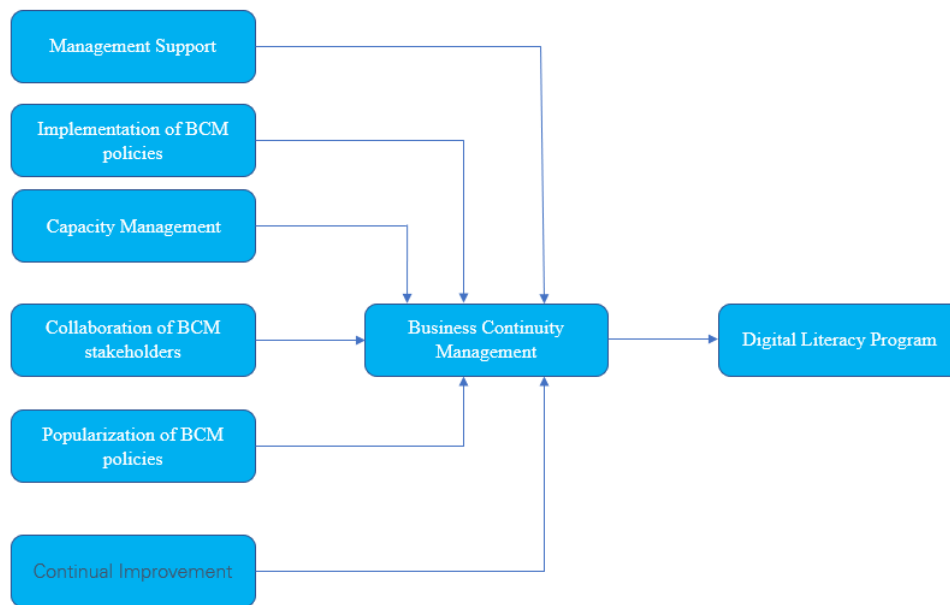
Figure 8: BCM Framework

5.4 Limitations of the Study

The study found that there were few options for the institutions and organizations carrying out the digital literacy program since they only dealt with what was in the government blueprints. The digital learning devices and facilities studies were limited to what the government had offered and advised. It was hard to establish the business continuity management concept as most respondents were not aware of its existence and applicability.

5.5 Conclusion

This study sought to determine the implementation of the DLP in public primary schools in Kenya. The study found out that the choice of digital devices, facilities used, and business continued policies played a crucial role in the implementation of the DLP. Governments keen on improving digital literacy should therefore greatly consider these aspects for the digital literacy program to be a success.

5.6 Recommendations for Future Research

Literature study showed that there were other variables that came to play in the implementation of the Digital Literacy Program. The most dominant ones that the research found out were curriculum alignment, teachers' competence, resource allocation, awareness and learner diversities. It would also be of interest to study the role of special interest groups and community involvement in the implementation of the Digital Literacy Program. A model encompassing these moderating variables would be of interest for further research.

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APPENDICES

PROPOSED MAKUENI COUNTY BUSINESS CONTINUITY MANAGEMENT FRAMEWORK FOR DIGITAL LITERACY PROGRAM

August 2021

Document Review and Approval

Revision History

Version	Author	Date
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Review History

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Reviewer	Date Reviewed
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This document has been approved by

Name	Date	Signature
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Contents

Introduction

This document seeks to specify the framework for the implementation of a Digital Literacy Program Business Continuity Management for a county in Kenya, one of the delivery channels of Devolution, as set out in the Constitution of Kenya, 2010.

Scope

The Digital Literacy Program Business Continuity Management Framework covers key areas underscored in research that have been missing and considered critical. These areas are also underpinned in the ISO 22301:2019 guidelines.

The areas of concern are as follows:

1. Management Support.
2. Implementation of BCM Policies.
3. Capacity Management.
4. Collaboration of BCM Stakeholders.
5. Popularization of BCM Policies and Procedures.
6. Continual Improvement.

County	Makueni County
Process Owner(s)	County Director of Education County Minister for Education
Process Owner(s) report(s) to	Cabinet Secretary, Ministry of Education County Governor
Proposed Process Team Headcount	Fourteen (14)
Activities Carried Out	The Business Continuity Management ensure efficient implementation of the Business Continuity Policy, enforce compliance and ensure continual improvement of the program in the contexts of the Digital Literacy Program

The guidelines specified in this document are generic and have been made in light of the Covid-19 Pandemic, during which time the document was generated. The guidelines are also in the context of a county set up, focusing only on public primary schools.

Framework Objective

This framework intends to offer guidelines for maintaining and implementing a Business Continuity Management plan for the Digital Literacy Program, to ensure learning continues even in the event of a disruption. This will have an overall effect of protection of life, property and the environment.

Definition of Terms

Business Continuity- the ability of an organization to continue with the delivery of products and services at predefined capacity and within acceptable time frames during a disruption.

Business Continuity Plan-the documented information that guides how an organization responds to a disruption and ultimately resume, restore and recover the delivery of products and services in line with its business continuity objectives.

Likelihood of Occurrence Classification (LOC). This is a measure of how an asset is susceptible to a threat.

Potential Impact of Occurrence (PIO). This is the measure of the likely impact of occurrence of a risk

Asset Classification (AC). This is a measure of an asset's importance based on its criticality.

Control Effectiveness (CE). This is a determination of the control measures put in place to ensure proper functioning of the Business Continuity Management program

1.0 MANAGEMENT SUPPORT

The top management team shall perform the below functions:

1. Ensure establishment of a business continuity policy, with clear objectives, for the digital literacy program.
2. Ensure allocation of resources needed for implementation of the business continuity policy.
3. Ensure communication on the importance of having effective business continuity plans and conformity to the same.
4. Direct and support personnel to contribute to effecting the business continuity plans set out.
5. Support personnel in managerial positions in effecting their leadership towards actualization of the set business continuity objectives.
6. Provide a commitment to ensuring the established business continuity plans are implemented.
7. Provide a commitment to continual improvement of the business continuity plans

Recovery, Mitigation and Continuance Duration Determination

This is a determination of the target time, from the occurrence of a risk to the time normal operations continue. Depending on the type of risk, a determination will be made on how the management proposes to handle the situation and ensure operations continue.

No	Type of Risk	Proposed Resumption Period

Business Continuity Top Management Team

The Business Continuity Top Management Team shall comprise members drawn from the relevant National and County Government institutions.

The Team shall comprise members from the below institutions:

1. Ministry of Education. A member from the National Education Board, County Education Board, Teachers Service Commission, each of the six (6) sub counties' education officers in Makueni County and the primary schools Board of Management.

2. Ministry of ICT. One representative, from the ICT Authority.
3. County Government. A representative from the County Government Ministry of Education.
4. Special Interest Groups. A member each drawn from the county teachers' trade union and Parents' Association.

The individual office holders' details shall be captured in the below table:

Count	Stakeholder Name	Parent Organization	Email Address	Cell Phone No
1.				
2.				
3.				

Proposed BCP Top Management Team

Proposed BCP Top Management Team
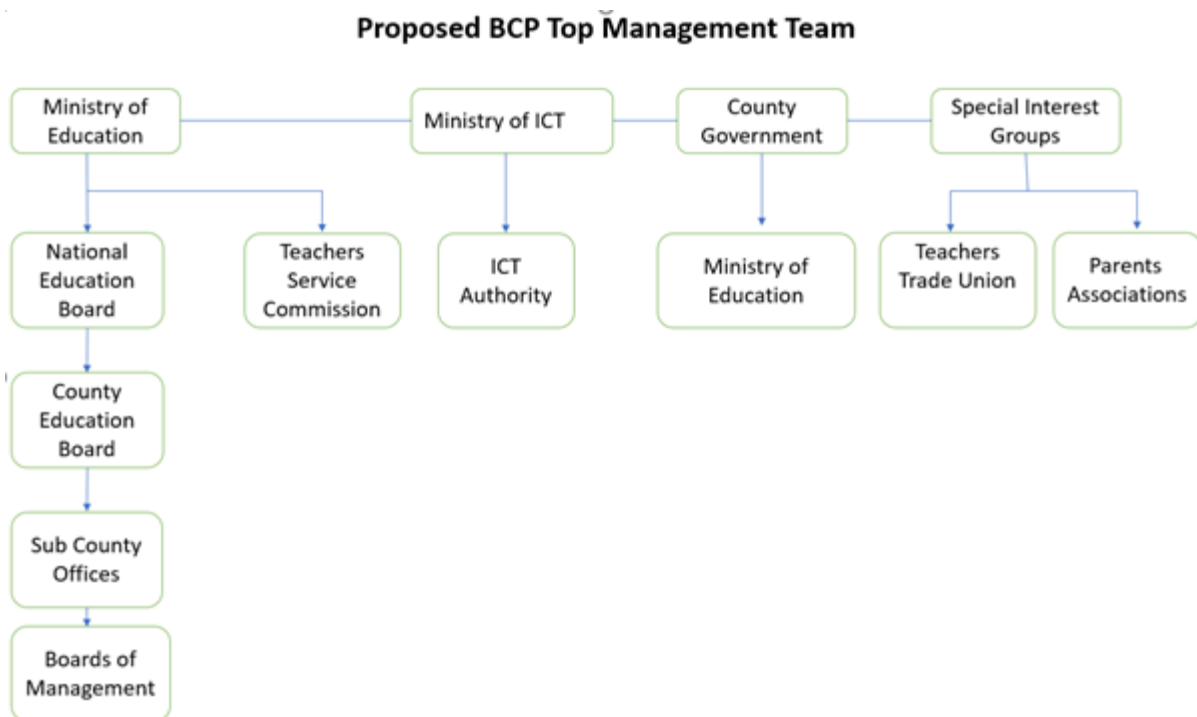
2.0 IMPLEMENTATION OF BCM POLICIES

The below process diagram shall guide the implementation procurement process of the BCM

BCM Implementation Flow Diagram
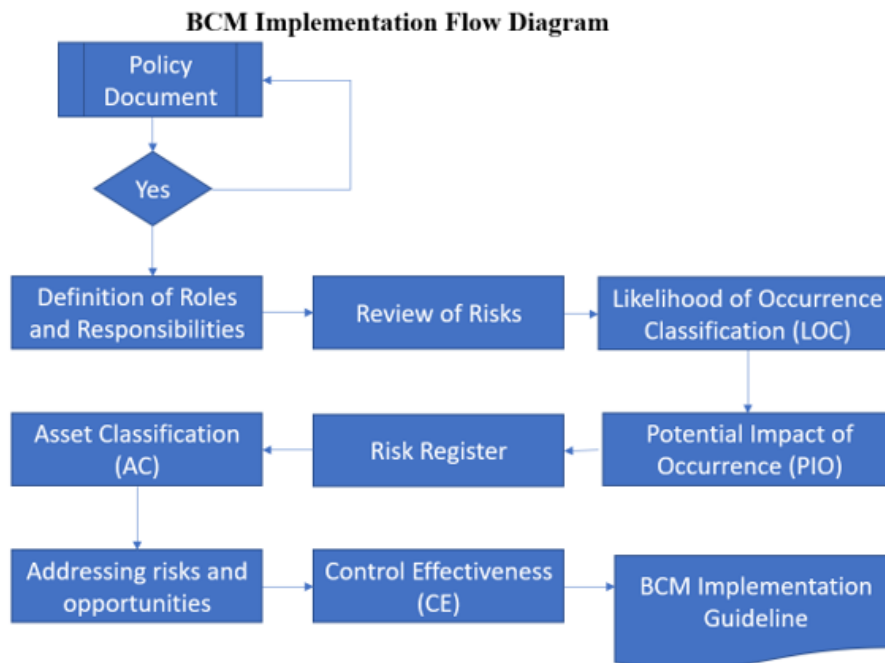
i) Policy Document

After the creation of the business continuity management policy, this policy shall, with the guidance of the top management;

1. Be availed as documented information.
2. Be communicated to the relevant education stakeholders.
3. Be available, as appropriate, to interested parties

ii) Definition of Roles and Responsibilities

Roles and responsibilities for the relevant roles shall be assigned and consequently communicated to the relevant education stakeholders. These roles and responsibilities shall, ultimately;

1. Ensure that set objectives conform to the risks to be addressed.
2. Provide a report on the performance of the set objectives

iii) Review of Risks

Risks that need to be addressed shall be determined and measures to address them documented. These measures shall be geared towards:

1. Preventing or reducing undesired outcomes
2. Giving assurance of continuity
3. Giving assurance of continual improvement

A risk register, with a likelihood of occurrence determination, and the potential impact of occurrence shall be availed and updated as and when necessary.

iv) Likelihood of Occurrence Classification (LOC)

This is a measure of how an asset is susceptible to a threat. Values are assigned on the likelihood of occurrence of threats as below:

Classes	%	Criteria
Almost Certain	>75%	The risk is common and repetitive; it is almost certain to occur
Likely	50%-75%	There is more than an even chance of occurring
Possible	25%-50%	There is a history of occurrence of the risk thus the risk event may occur
Unlikely	10%-25%	There has been limited history of occurrences of the risk hence risk occurrence is improbable
Rare	<10%	The risk event is not expected to happen. There has been no previous report of occurrences.

v) Potential Impact of Occurrence (PIO)

This is the measure of the likely impact of occurrence of a risk.

A scale for the same is shown below:

Impact	Metrics of Measurement Metrics
Low	Occurrence of the risk will not have an impact on the achievement of learning activities.
Medium	Occurrence of the risk will have little impact on the achievement of the learning activities
High	Occurrence of the risk will make it very unlikely the achievement of the learning activities

vi) Risk Register

The below table should always be populated when determining risks: their likelihood of occurrence and impact of occurrence.

Risk	Likelihood of Occurrence	Potential Impact of Occurrence
Instructor death, sickness or family issue		
Power failures		
Extreme weather events		
Natural disasters eg floods, earthquakes		
War		
Pandemic		

vii) Asset Classification (AC)

This is a measure of an asset's importance based on its criticality. In this form, we assign values as shown below:

Classes	Score	Criteria
High	3	Unavailability of asset will result to interruption of the whole learning process
Medium	2	Unavailability of asset will result to interruption of minor part of the learning process
Low	1	Unavailability of asset will result to insignificant impact to the learning business

The form below should always be filled and used to asset importance classification

Asset	Classification of Importance
Learner Digital Device (LDD)	
Teacher Digital Device (TDD)	
Projector	
Braille Embosser	
Wireless Router	
Digital Content Server	
Network Devices- UPS (Uninterruptible Power Supply	
Laptop	

viii) Addressing risks and opportunities

Measures to mitigate risks identified shall be established. These measures shall:

1. Be consistent with the risks identified
2. Be measurable
3. Consider the known and unknown risks
4. Be monitored
5. Be communicated
6. Be updated as appropriate

ix) Control Effectiveness (CE)

This is a determination of the control measures put in place to ensure proper functioning of the Business Continuity Management program. Values are assigned as below:

Classes	Score	Criteria
Unsatisfactory	3	Control measures are ineffective and there are major deficiencies
Partially Satisfactory	2	Some of the risk exposure appears to be controlled but there is room for improvement
Satisfactory	1	Majority of risk exposure is controlled

The below table will be used to capture measures taken and to evaluate their effectiveness

Count	Measures Taken	Effectiveness
1.		
2.		

3.0 CAPACITY MANAGEMENT

Resources (both human and financial) shall be provided.

Human Resources

There shall be a fully constituted team tasked with the establishment, implementation, maintenance and continual improvement of the business continuity program. The management shall:

1. Establish the competence of personnel working under it
2. Ensure the business continuity implementation team has the requisite training and education requirements
3. Ensure availability of these resources when required
4. Ensure evidence of competence is maintained

4.0 COLLABORATION OF BCM STAKEHOLDERS

Depending on the type of risk, the BCM top management shall liaise with the relevant government ministries handling the situation. For the avoidance of doubt, the principal ministries shall be the Ministry of Education and Ministry of ICT.

At the very least, the below parties shall be included in the list of collaborators:

1. Ministry of Education
2. Ministry of ICT
3. Local Teachers' Trade Union
4. Local Parents' Association

These parties shall keep in touch and follow directives of the ministry handling the risk.

5.0 POPULARIZATION OF BCM POLICIES AND PROCEDURES

Awareness

The management shall ensure that the relevant education stakeholders are made aware of:

1. The business continuity policy
2. The importance of an effective business continuity policy
3. The implications of non-conformance to the business continuity requirements

Communication

The management shall determine the relevant channels for communication of the business communication facets. Particularly, the management shall determine:

2. When it will be communicated
3. The target audience
4. The personnel tasked to do the communication
5. The channels of communication
6. Any third party to be employed to assist with the communication

6.1 CONTINUAL IMPROVEMENT

The management shall continually determine opportunities for improvement of the business continuity plans and take the necessary actions to achieve them. Through audits and self-reviews, the management shall strive to improve the suitability, adequacy and effectiveness of the measures taken to address control gaps.

From management reviews, the management shall evaluate the level of conformity to the set standards and if nonconformities occur, the management shall institute measures to:

1. Take actions to control the issues identified
2. Deal with the consequences of the results of risks already propagated
3. Take corrective actions to prevent recurrence of the issues already occurred
4. Perform a root cause analysis of the reasons for the occurrence of the issues occurred
5. Determine if similar issues exist or if they can potentially occur

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P.O Box……………………………………….
Email Address: ……………………………….

Office of the County Ministry of Education
Name: ………………………………………..
P.O Box……………………………………….
Email Address: ……………………………….

Introductory Letter to Interviewees

Dear Participant,

My name is Emmanuel Mwendwa Kyalo. I am a resident of Mbooni Constituency, Makueni County.

I am currently undertaking a master's program at the University of Nairobi. I am conducting research as part of the master's program.

The data that I will obtain from this research will assist me with getting insights on the status of the Digital Literacy Program in Makueni County.
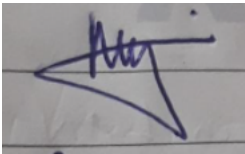
The purpose of this letter is to request for your assistance with information. I'd also like to point out that the data obtained will be purely used for academic purposes.

Your participation in this study will be purely intentional. You may withdraw from the same voluntarily, and there will be no consequences to the effect. Participation in the study will not be paid.

Attached is a copy of a letter from the university and NACOSTI authorizing research.

Thank you in advance for taking your time to take part in this exercise.

Kind Regards,

Emmanuel Mwendwa Kyalo

Email: mwendwakyalo@students.uonbi.ac.ke/mwendwakyalo10@gmail.com

Adults' Questionnaire

IMPLEMENTATION OF DIGITAL LITERACY PROGRAM IN PRIMARY SCHOOLS: A CASE STUDY OF MAKUENI COUNTY, KENYA

I am humbly requesting your assistance in filling out the below questionnaire on Digital Literacy Program (DLP). Your feedback will assist me understand your perspective, level of awareness as well as the challenges and opportunities of the program. The data obtained will be purely used for academic purposes.

Your participation in this study will be purely intentional. You may withdraw from the same voluntarily, and there will be no consequences to the effect. Participation in the study will NOT be paid.

Thank you in advance for taking your time to participate in this exercise.

* Required

General Information

1. What is your gender?

   Mark only one oval.

   o   Female
   o   Male
   o   Prefer not to say

2. What is your highest level of education?

   Mark only one oval.

   o   No formal education

   o   Basic education

   o   P1 or Equivalent

   o   P2 or Equivalent

   o   Certificate

   o   Diploma

   o   Degree

   o   Masters

   o   PhD

   o   Other

3. What is your age bracket?

   Mark only one oval.

   o   1-18 years

   o   19-30 years

   o   30-40 years

   o   40-50 years

   o   Over 50 years

4. Which best describes your primary job function?

Mark only one oval.

- o Tutor or Equivalent
- o Headteacher or Equivalent
- o Ministry Official
- o County Government Official
- o Ministry/Parastatal Official
- o Other

5. For how long have you been employed?

Mark only one oval.

- o Less than 3years
- o 3 – 5 years
- o 6-10 years
- o Above 10 years

6. State your proficiency/knowledge of the Digital Literacy Program

Mark only one oval.

- o Basic
- o Intermediate
- o Advanced
- o None

Section II: Institutions Information

In this context, Institution refers to the place of work (individual primary school, ministry, parastatal, county government, etc)

7. Which best describes your organization or entity?

Mark only one oval.

- o Primary School/Education Entity
- o County Government Entity
- o Government Parastatal
- o Information Technology/Telecommunications

8. How many people are employed by your organization?

Mark only one oval.

- o >5000
- o 1000<5000
- o 500<1000
- o 100<500
- o <100

9. How would you describe the geographical operational area of your institution?

Mark only one oval.

- o Local
- o Regional
- o National
- o Global

ICT Facilities/Infrastructure

This section seeks to understand the availability of infrastructural facilities for the digital learning program and their influence in the whole digital learning process

10. For each of the below ICT Infrastructural resources, kindly tick appropriately.

Mark only one oval per row.

	o Yes	o No
Availability of stable power supply (electricity or solar)	o	o
Availability of classrooms secured with grill doors and windows	o	o
Availability of secure storage units for the learning devices	o	o
Proper ventilation of classrooms and storage units	o	o
Availability of dustproof floors	o	o
Availability of flat, wide desks	o	o

Likelihood of Occurrence Determination (LOD)

This section seeks to test how likely risks that could affect the digital literacy program are likely to occur

11. Which of the below risks are more likely to occur and thus affect the ICT infrastructure running the DLP? *

Mark only one oval per row.

	Almost Certain	Likely	Possible	Unlikely	Rare
Instructor death, sickness or family issue	○	○	○	○	○
Power failures	○	○	○	○	○
School unrest	○	○	○	○	○
Weather events	○	○	○	○	○
Natural disasters eg floods, earthquakes	○	○	○	○	○
War	○	○	○	○	○

12. Of the above risks, kindly rate their likely risk impact. A scale for the same is shown below:

Low- Occurrence of the risk will not have an impact on the achievement of learning activities.

Medium- Occurrence of the risk will have little impact on the achievement of the learning activities

High- Occurrence of the risk will make it very unlikely the achievement of the learning activities

Mark only one oval per row.

	High	Medium	Low
Instructor death, sickness or family issue	○	○	○
Power failures	○	○	○
School unrest	○	○	○
Weather events	○	○	○
Natural disasters eg floods, earthquakes	○	○	○
War	○	○	○

13. Are the entry points to the facilities manned 24X7?

Mark only one oval

- ○ Yes
- ○ No

14. Are multiple sources for raw power available?

    Mark only one oval.

    o Yes

    o No

15. Is there a stand-by UPS which can take over in the event of failure of primary power connection?

    Mark only one oval.

    o Yes

    o   No

16. Is the access to buildings hosting DLP equipment restricted to authorized personnel only?

    Mark only one oval.

    o Yes

    o No

    o Not sure

17. Is there any asset tracking procedure in place (movement of assets inside and outside the learning facilities)?

    Mark only one oval.

    o Yes

    o No

    o Not sure

18. Does the institution have good network coverage?

    Mark only one oval.

    o Yes

    o No

    o Not sure

19. Which internet connection does the institution use?

    Mark only one oval.

    o Modem

    o Ethernet

    o Cable None

    o Other:

Choice of Digital Devices for the Digital Literacy Program

This section seeks to establish the influence of the choice of digital devices on the whole digital learning process.

20. Kindly rate your level of agreement with the following statements on the Digital Learning devices. *

Mark only one oval per row.

	1. Strongly Disagree (SD)	2. Disagree (D)	3. Neutral (N)	4. Agree (A)	5. Strongly Agree (SA)
The DLP devices are easy to use and user friendly	○	○	○	○	○
The DLP devices accommodate specific learning goals	○	○	○	○	○
The DLP devices have ability to support different styles of learning	○	○	○	○	○
The DLP devices can take into account varying interests children may have	○	○	○	○	○

Asset Class Importance (ACI)

This is a measure of an asset's importance based on its criticality. In this form, we assign values as shown below:

Classes	Score	Criteria
High	3	Unavailability of asset will result to interruption of the whole learning process
Medium	2	Unavailability of asset will result to interruption of minor part of the learning process
Low	1	Unavailability of asset will result to insignificant impact to the learning business

21. Kindly rate each of the below DLP devices based on your view on their importance to the success, or its lack thereof, of the DLP program *

Mark only one oval per row.

	High	Medium	Low
Learner Digital Device (LDD)	○	○	○
Projector	○	○	○
Teacher Digital Device (TDD)	○	○	○
Braille Embosser	○	○	○
Digital Content Server	○	○	○
Wireless Router	○	○	○
Network Devices- UPS (Uninterruptible Power Supply	○	○	○
Laptop	○	○	○

Likelihood of Occurrence Determination (LOD)

This is a measure of how an asset is susceptible to a threat. We assign values to the likelihood of occurrence of threats as below:

Classes	%	Criteria
Almost Certain	>75%	The risk is common and repetitive; it is almost certain to occur
Likely	50%-75%	There is more than an even chance of occurring
Possible	25%-50%	There is a history of occurrence of the risk thus the risk event may occur
Unlikely	10%-25%	There has been limited history of occurrences of the risk hence risk of occurrence is improbable
Rare	<10%	The risk event is not expected to happen. There has been no previous report of occurrences.

22. Kindly rate the likelihood of occurrence of the below risks:

Mark only one oval per row.

	Almost Certain	Likely	Possible	Unlikely	Rare
Breakdown of DLP devices	○	○	○	○	○
Physical Intrusion /Loss/theft	○	○	○	○	○
Failure of Application Software	○	○	○	○	○
Failure of environmental controls(humidity, temperature)	○	○	○	○	○
Loss or absence of personnel	○	○	○	○	○
Malicious Code	○		○	○	○
Utilities failure eg power	○	○	○	○	○
Inaccessibility of premises due to social unrest/curfew etc.	○	○	○	○	○

Control Effectiveness (CE)

This is a measure of the measures put in place to ensure that the DLP devices are working/available as expected. In this form, we assign values as below:

Classes	Score	Criteria
Unsatisfactory	3	Control measures are ineffective and there are major deficiencies
Partially Satisfactory	2	Some of the risk exposure appears to be controlled but there is room for improvement
Satisfactory	1	Majority of risk exposure is controlled

23. Kindly rate each of the below control measures put in place by the Ministry to ensure the ensure that the DLP devices are working/available as expected

Mark only one oval per row

	Unsatisfactory	Partially Satisfactory	Satisfactory
Insurance of digital learning devices	○	○	○
Replacement of faulty digital learning devices	○	○	○
Repair of faulty digital learning devices	○	○	○
Call Center Support for digital learning	○	○	○

Business Continuity Management Survey

Business Continuity Management (BCM) Survey outlines how an institution will continue operating in the event of the occurrence of an unplanned disruption. It basically outlines procedures that an institution will follow in the event of an occurrence of a disaster. This survey seeks to understand measures taken or those that should have been taken to address continuity of the Digital Learning Program, especially with the Covid-19 Outbreak

24. Are you aware of the existence of a Business Continuity Management Policy in your institution?

Mark only one oval.

o Yes

o No

o Not Sure

25. If Yes to the above question, for how long has the Business Continuity Management Policy been in place in your institution?

Mark only one oval.

  o 10 years or more

  o 5 years to < 10 years

  o 3 years to < 5 years

  o 1 year to < 3 years

  o Less than 1 year

  o Not Sure

26. Are there at least three (3) trained teachers trained for the Digital Literacy Program in your institution?

Mark only one oval.

o Yes

o No

o Not Sure

27. Does your organization maintain and foster relationships with the relevant external government agencies to ensure continuity of your organization activities in case of a disaster?

Mark only one oval.

o Yes

o No

o Not Sure

28. Is there a Business Continuity Management Team with defined roles, responsibilities and authority to act in the event of a major disruption?

Mark only one oval.

o Yes

o No

o Not Sure

29. Are employees trained and made aware of their roles in the implementation of the Business Continuity Plan?

Mark only one oval.

o Yes

o No

o Not Sure

30. Are sufficient human and financial resources made available to provide support for Business Continuity Management?

   Mark only one oval.

o Yes

o No

o Not Sure

31. What are the primary reasons that your organization has established a Business Continuity Management Program?

   Mark only one oval.

   o Government Regulation

   o Industry Standards

   o Lessons learnt   from an actual   event

   o Audit findings/recommendation

   o N/A

   o Other

32. How does your organization measure the performance of your Business Continuity Management Program?

   Check all that apply.

   o Comparison with Industry Standards

   o Audit Findings

   o Business Continuity Performance Reviews

   o N/A

Since Covid-19 Outbreak

33. Has Your Organization Reviewed its Business Continuity Management Policy?

   Mark only one oval.

o Yes

o No

o Not Sure

34. Has Your Organization Tested its Business Continuity Management Policy?

   Mark only one oval.

o Yes

o No

o Not Sure

35. Has Your Organization Conducted Business Continuity Management Training for Your Employees?

Mark only one oval.

o Yes

o No

o Not Sure

36. Has Your Organization Updated Emergency Contact Information?

Mark only one oval.

o Yes

o No

o Not Sure

37. Which incident(s) has your organization experienced in the past year that could make business continuity plans worth considering?

Check all that apply.

- o Civil Unrest
- o Cyberattacks/breaches
- o Natural calamities
- o Pandemics
- o IT Related issues
- o Power outages
- o Bad weather
- o Terrorist attacks

38. When was the most recent interruption requiring you to activate one or more business continuity plans?

Check all that apply.

- o More than 2 years ago
- o Within the past two years
- o Within the past year
- o Within the past six months
- o Never
- o Can't Tell

General Questions

39. What unique challenges have you encountered with the Digital Learning

Program that might not have been captured in the questionnaire?

_____

40. What improvements would you suggest be made to the Digital Learning Program?

_____

Pupils Questionnaire

IMPLEMENTATION OF DIGITAL LITERACY PROGRAM IN PRIMARY SCHOOLS: A CASE STUDY OF MAKUENI COUNTY, KENYA

I am humbly requesting your assistance in filling out the below pupils' questionnaire on Digital Literacy Program (DLP). The feedback will assist me understand the pupil's perspective, level of awareness as well as the challenges and opportunities of the program. The data obtained will be purely used for academic purposes.

The pupils' participation in this study will be purely intentional. The pupils may withdraw from the same voluntarily, and there will be no consequences to the effect. Participation in the study will NOT be paid.

Thank you in advance for taking your time to assist me carry out this exercise

1. When did you lastly learn with the Digital Literacy Program Devices? *Mark only one oval.*

o The past one week

o The past one month

o I don't remember

2. For each of the below questions, kindly respond correctly

Mark only one oval per row.

	Yes	No
Do you know how to operate the Digital Literacy Program Devices?	o	o
Have you operated the Digital Literacy Program Devices before?	o	o
If you were allowed to carry the Literacy Program Devices home, would you be able to learn at home?	o	o

Do you know any other Digital Literacy Devices other than the ones you are taught with?	○	○
Do you enjoy interacting with the Digital Literacy Devices?	○	○

3.What do you like most about the Digital Literacy Program?

_____

_____

_____