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Technology in education – Southeast Asia

Technology in education: a case study on Lao People's Democratic Republic

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ABSTRACT

Digital technology has the potential to transform learning and offer a solution to persistent challenges in equity of access and quality of learning for all students. COVID-19 has accelerated the adoption of technology to deliver alternative modes of education. It has also put the spotlight on the digital divide that technology creates. This Case Study explores the progress of technology integration in the education sector in Lao PDR in line with its aspirations for a thriving digital economy driven by a digitally-skilled workforce. It explores the current conditions that facilitate or inhibit digitalization of the education sector and considers the impact across the system, sector-wide and school levels. This includes issues relating to digital access, digital literacy of teachers and students, technology infrastructure investments and the regulatory environment. The findings suggest that many of these challenges are not unique to Lao PDR. However, with a clear strategy, political commitment and sustainable resourcing of the education sector, there are opportunities for the Government of Lao PDR and its partners, to set a strong foundation for digitalizing the education system.

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INTRODUCTION

Within the changing education landscape in a post-pandemic world and the rapid evolution of technology advancements, countries are now faced with new demands and expectations to deliver more efficient, equitable and higher quality education through the use of technology. Indeed, technology is central to the achievement of Sustainable Development Goal (SDG) 4 and was explicitly highlighted in the Incheon Declaration that 'Information and communications technologies (ICTs) must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision'. The various targets under SDG4 identifies five areas where technology has an influence (UNESCO, 2022):

- Input: investments in technology infrastructure
- Means of delivery: understanding effective use of technology in teaching and learning
- Skill: supporting users with adequate digital skills to effectively engage in teaching and learning
- Tool for planning: using technology tools to help improve the efficiency and effectiveness of education system management
- Social and cultural context: protecting risks to safety, privacy equality and social cohesion

Evidence from high performing systems suggests that successful integration of technology in education are more likely to be supported by broader national goals and commitments relating to the development of an advanced knowledge-based economy (Saubern, 2022). However, while technology in education promises to transform traditional teaching and learning by providing students with new skills, improving teacher training, minimising costs of mainstream educational approaches and increasing the reach to rural students, the evidence on student learning outcomes has been mixed (OECD, 2020). Some studies demonstrate improvement at the local level, but do not translate into effective practice at scale. In other studies, there is strong evidence supporting the use of technology in addressing the needs of students who are underserved by traditional instruction methods, including students with special needs (Saubern, 2022).

Like other countries in the Southeast Asia region, the use of digital technologies is expanding in Lao People's Democratic Republic (Lao PDR), which has been fast-tracked with the onset of the COVID-19 pandemic. However, the experience of COVID-19 brought into sharp focus the opportunities and challenges afforded by the promise of a digitalized education system in Lao PDR, particularly to meet the needs of marginalized groups. During the pandemic, 78 percent of urban children and 87.5 percent of rural children in Lao PDR were unable to access schooling due to a lack of access to digital resources to support remote learning (USAID, 2021). These statistics raise concerns that widespread adoption of technology can lead to a deepening of the digital divide in the education system in Lao PDR, which is already facing challenges over access and quality. Recognizing these challenges, the Government of Lao PDR has made a strong commitment to an education reform agenda that prioritizes equity of access and educational outcomes for all children, particularly those most disadvantaged by poverty, remoteness, and ethnic background. The Lao PDR Education and Sports Sector Development Plan (ESSDP) 2021-2025 (Ministry of

Education and Sports, 2021c), provides the strategic objectives for achieving these outcomes. Importantly, it was endorsed during a critical time under the evolving COVID-19 context, which highlighted gaps and opportunities for policy setting to support education recovery and long-term transformation. This Case Study on technology and education in Lao PDR explores the preconditions for supporting the effective integration of technology in the Lao education system to drive human capital development and socio-economic outcomes through greater access to equitable and quality learning for all.

Education challenges and the potential of education technology

1. Equity and inclusion: Access to education

Over the last few decades, the inevitable advancements in technology have prompted a growing body of research on technology and its impact on educational processes and learning outcomes. While the evidence is still mixed, there is widespread recognition that technology has the potential to address some of the most persistent challenges faced by education systems. In particular, technology provides an opportunity to reach the most underserved learners, who often experience multiple dimensions of disadvantage including remoteness, poverty, ethnicity, disability and gender. For these students, technology offers a means for an alternative learning experience where traditional and mainstream educational approaches may have failed, including in-person, didactic and one-size-fits-all approaches.

1.1. Political commitment supporting access for disadvantaged groups

The Government of Lao PDR is committed to providing equitable and quality educational opportunities for all Lao students through the introduction of legislation and national commitments to education outcomes. As a result, Lao PDR has made significant gains in the education sector over the last two decades due to rapid expansion of the education system. Net enrolment rates in primary education have steadily increased to over 90 percent, and between 2010 and 2020 the share of children in lower-secondary who were out of school was reduced by half (UNICEF, 2020). However, the quality of education remains a concern, especially with regards to student learning: results from the recent Southeast Asia – Primary Learning Metrics (SEA-PLM, 2021) regional assessment show that 50 percent of Lao Grade 5 students scored in the lowest proficiency level in reading, with only two percent reaching the minimum proficiency level as defined in SDG 4.1.1b (level 6 and above) (UNICEF & SEAMEO, 2020). Results from national assessments in primary and lower secondary grades also show very low levels of learning. These issues of quality, as well as on-going concerns about drop-out rates among rural and ethnic groups, are amplified by experiences of poverty, where almost one in four households live in poverty and the costs of attending school can make it unaffordable for some families (World Bank, 2015).

The Lao PDR ESSDP 2021-2025 (Ministry of Education and Sports, 2021c), is explicit in removing the barriers for disadvantaged students to access a quality education. This includes abolishing school fees for students from poorer families who are at risk of dropping out of school, as well as providing: incentives and facilities to encourage the enrolment of students from remote areas; scholarships to upper secondary students from low-income families; remedial support; and sufficient textbooks. The ESSDP 2021-2025 also identifies a strategy for reducing the performance gap between advantaged and disadvantaged schools by allocating additional human, financial and use of ICT to cluster schools across the 40 identified priority districts[1] (Ministry of Education and Sports, 2021c). Despite a policy abolishing school fees, there are concerns that other school-related fees such as textbooks, equipment and examinations continue to make education prohibitive for poorer students.

Other government ministries have also committed to prioritising geographical inclusiveness as part of the development and implementation their strategies for technology-enabled services. These include the Ministry of Health, Ministry of Planning and Investment, Ministry of Finance, and the Ministry of Labour and Social Welfare which consider factors such as age, gender, skills, affordability and disabilities to ensure inclusivity in their plans for e-services (Mukherji et al., 2022).

1.2. Access to digital resources and infrastructure

Similar to many low and low-middle income countries in the Southeast Asia region, the digital infrastructure in Lao PDR has grown significantly in recent years. Mobile coverage on the fastest available network (4G/LTE) is as high as 80 percent across Lao PDR (World Bank, 2022) and 92 percent of households reported having access to a mobile phone (UNICEF, 2018). Internet subscriptions increased by 33 percent from 2016 to 2019 with over 3.5 million users (Mukherji et al., 2022). While the availability of mobile phones and widespread network coverage may have the most potential for enabling remote education, experience from the COVID-19 pandemic suggests this did not translate into equitable access to learning. This was due to the unreliability of the mobile network and the high cost of internet and mobile subscriptions, which is above the ITU-UNESCO affordability threshold of two percent of income per capita (World Bank, 2022).

The challenges relating to infrastructure, connectivity and affordability are magnified for much of the population that live in rural and remote areas. Due to Lao PDR's mountainous geography and lack of rural infrastructure, rural communities still lag behind in access to technology with just 0.3 percent of rural households having fixed broadband, two percent have computers, 49 percent have television and 15 percent have radios (Runde et al., 2022). For rural households, the COVID-19 pandemic demonstrated that even the availability of low-technology approaches, such as television and radio, did not ensure widespread access to remote learning, due to an unreliable electricity supply to power ICT devices. Although 94 percent of households throughout the country have electricity,

[1] The Education and Sports Sector Development Plan identifies the 40 priority districts as having poor educational performance, are in food insecure areas and are remote. They are often severely under-staffed and must rely more on multigrade teaching, volunteer teachers or non-subject specialist teachers.

it is estimated that only 34 percent of schools in the 40 priority districts have electricity (Global Partnership for Education, 2020).

The lack of access to digital devices has also been identified as one of the major limitations for students in Lao PDR to engage with technology for learning and to develop digital literacy skills. There is a lack of computers, smart devices and hardware (such as printers) in schools, particularly in rural areas. This created particular challenges for delivering remote learning during the COVID-19 pandemic, where teachers reported copying exercises from textbooks onto paper and distributing them to their students to support home learning. According to one informant, a survey conducted the World Bank during the COVID-19 pandemic found that only 20 percent of school directors reported the use of any kind of remote teaching or distance learning during the school closure periods. For the schools that did engage in remote learning, 90 percent reported using take-home packages. As one provincial education officer noted, the lack of access to devices was a major constraint to conducting remote learning during COVID-19:

> **For online learning, some parents do not have access online or compatible smart phone and if they do, they have to take it with them to work. Some classes had to be organised in the evening so they could access the device from their parents.**

Many teachers, particularly those in remote areas do not have their own computers or smartphones to access online content or professional learning opportunities. Those that do, express difficulties accessing digital resources due to a lack of skill and or affordability to connect to the internet. In addition, considerations for the development of digital literacies for teachers would require an understanding of accessibility needs and options that can be applied through a device or platform.

1.3. Disadvantaged groups

Even where digital resources and infrastructure exist to support online or remote learning, disadvantaged students often fall behind their peers due to factors relating to their home environment such as lack of parental support or low parental literacy, lack of a physical space to study, responsibility for household chores or seasonal work, and lack of remedial support for learning. Girls in particular, face unequal access to technology and the opportunity to gain digital skills compared to boys (SEAMEO, 2021). This is consistent with findings in many low and middle-income countries worldwide, where the intersectionality of disadvantage is more likely to be experienced by girls than boys. For example, it was found that girls who belong to ethnic minority groups[2] in Lao PDR have lower levels of digital skills than non-ethnic minority students and face a number of challenges even before they start school, such as a lack of a stimulating home environment, lack of pre-primary education, and low or no Lao language skills (SEAMEO, 2021; Wong et al., in press).

[2] There are four ethnolinguistic groups in Lao PDR: Lao-Tai (62.4 percent), Mon-Khmer (23.7 percent), Hmong-lu Mien (9.7 percent), Chine-Tibetan (2.9 percent) (Lao Statistics Bureau, 2016)

Overall, children from ethnic minority groups are less likely to be enrolled in school than those from the Lao-Tai group. For example, 94 percent of Lao-Tai children attend primary school compared with 83 percent from Mon-Khmer families (UNICEF, 2020). Inequality is exacerbated by poverty and rural location, with those in rural areas five times more likely to be out of school than their urban counterparts at the upper secondary level (UNICEF, 2020). While attendance at the primary level is high (90 percent), the drop-out rate increases at the lower and upper-secondary levels, with almost 400,000 children out of school in Lao PDR (UNICEF, 2020). The pandemic put further strains on low-income families, where seven percent reported that their children had dropped out of school due to an inability to meet the cost of schooling or the need for children to participate in the additional work (World Bank, 2023). Despite a policy shift to strengthen inclusive education in the new curriculum and teacher professional learning, this has not yet translated into classroom practice (Wong et al., in press). Experience from the pandemic revealed little evidence of the use of technology to reach the most disadvantaged groups of students, due to constraints with digital infrastructure, family income and lack of digital skills to support online learning.

However, emergent research indicates that the introduction of new teaching strategies that place the student at the centre of learning, provide the opportunity to incorporate new technology and tools to support successful student learning. There is strong evidence to suggest that technology can facilitate the solution for different students, including neurodiverse students and students with disability (Saubern, 2022). For example, assistive devices in the classroom can provide an inclusive means of representing content that is more engaging for students with additional learning needs. In Lao PDR, a survey found that many young people with disabilities reported better digital literacy than those with no disabilities (SEAMEO, 2021).

At the policy level, there is a commitment by the Lao PDR Government to ensure students with disabilities have equal access to learning opportunities. During the COVID-19 pandemic, the Ministry of Education and Sports (MoES) provided tablets with accessibility options for children with disabilities to access online learning on the Kang Panya Lao platform (Ministry of Education and Sports, 2021d). Videos on the platform included subtitles and sign language to cater to students who are hearing impaired. For those who could not access online learning, children's books were translated and adapted to accessible EPUB formats. These efforts also filter down to the school level, where 86 percent of principals surveyed reported having a school inclusive education plan or strategy in place and 41 percent of schools provide materials to teachers to increase awareness about disabilities (BEQUAL, in press). However, this does not always translate into classroom practice. A situational analysis on ICT readiness in the education sector conducted in 2021 by the MoES found that almost half of the teachers surveyed reported having students with disabilities in the classroom, but only nine percent used technology to assist student learning on a regular basis.

2. Equity and inclusion: Access to content

Technology has the potential to unlock extensive learning resources to facilitate and enhance teaching and learning through alternative modes of disseminating knowledge and content to learners anywhere, any time. Digital content for learning can take many forms. The digitalization of textbooks can be shared online or downloaded onto a school computer or student mobile devices. Teachers can teach using shared digital resources and interactive media as a way to introduce students to more engaging content. Online communities can be used between teachers and students to facilitate the sharing of information and support for learning. However, the quality of approaches to the application of digital content varies widely and should be examined in relation to both context (such as policies, infrastructure and resources) and relevance for their users. While the evidence base demonstrates that educational technology can help deliver engaging and purposeful content in a cost-effective way, the evidence related to the use of technology in enhancing overall achievement at scale remains contested (Dabrowski & Nietschke, 2021).

Lao PDR is at a nascent stage in the development and adoption of digital content to support teaching and learning. In many districts, printed flashcards, photos and other visual teaching aids are still provided and preferred by teachers, while video content is less common. The ESSDP 2021-2025 does not articulate plans to support the introduction of digital resources for alternative modes of learning at the primary or lower secondary level. This is consistent with other countries in the early stages of technology adoption, where investments in devices is more likely to be prioritized than investments in the development of content which can be more costly (Trucano, 2016). As ICT learning systems mature, digital content becomes more prominent and the focus shifts to mapping digital content to the curriculum and the development of teaching and learning materials. However, at the upper secondary level, there is recognition by the Government of Lao PDR that high school graduates and vocational education students need digital skills and pathways to meet the demands of the labour market. For these groups of students, the ESSDP proposes to produce online learning materials and training courses using multimedia channels to better prepare them for work (Ministry of Education and Sports, 2021d).

2.1. Educational broadcasting

Educational broadcasting is the delivery of educational content and programmes via public television or radio. It can be a useful mechanism for transferring knowledge as it is not dependent on internet access, the availability of devices, or extensive resources. At the height of the COVID-19 pandemic, the use of television and radio were the most popular modes of education delivery by low and middle-income countries, with only 18 percent of high-income countries relying on radio (Global Education Evidence Advisory Panel, 2022). In the Southeast Asia region, only four countries (Lao PDR, Myanmar, Philippines and Timor-Leste) used radio for remote learning during the COVID-19 pandemic (UNESCO & UNICEF, 2021). While educational broadcasting was widely used during the COVID-19 pandemic, there are limited evidence on its efficacy due to the inability to measure the quality of student interaction and use of content (Dabrowski & Nietschke 2021). Only a third of low-income countries reported having assessed the effectiveness of television and radio broadcasting as a means of education delivery, with the likelihood that only a small proportion will be rigorous enough to produce evidence on impact (Global Education Evidence Advisory Panel, 2022).

In Lao PDR, educational broadcasting was quickly adopted at the onset of the pandemic to facility continuity of learning. The MoES, in collaboration with the Ministry of Information, Culture and Tourism (MICT) launched the first ever channel dedicated to providing learning content called LAO ESTV (Education and Sport TV) which broadcast programmes from 6am to 10pm daily. Initially, existing content from other TV programmes such as 'My Village TV' and 'Learn Together Laos' were used, and further content was gradually developed for ESTV during the pandemic (Nietschke et al., 2022). My Village TV was developed in 2012 as a joint initiative between UNICEF, the MoES and the MICT. The purpose of the television series was to help prepare children for school through the development of physical, language and social-emotional skills. Episodes were broadcast on public television and were available on multimedia and social media platforms. At home, the majority of children accessed content on television (73 percent), followed by YouTube on their parents' mobile devices (39 percent) (UNICEF, 2017). However, in the poorest households, access to My Village TV was predominantly through television (66 percent) or DVD (64 percent) (UNICEF, 2017). An evaluation of My Village found that it contributed to improving children's cognitive and language development; while parents and teachers reported changes in their attitudes and practices to support early childhood development (UNICEF, 2017). During the pandemic, UNICEF also broadcasted the television series 'My House' across several channels and online to support continuity of learning and to share COVID-19 health and sanitation messaging (UNICEF, 2021). Education broadcasting continues to be used post-pandemic, for the sharing of educational content and news. However, there is a lack of evidence on the effectiveness of television and radio to support student learning. Without evidence of impact, it is unclear if the Government of Lao PDR has plans to continue to develop content for television and radio to support learning, particularly to reach the most disadvantaged student populations.

2.2. Technology enabled learning

The use of technology to support learning is often seen as a cost-effective way to reach all learners, including those disadvantaged by distance, age, ethnicity and disability. This has prompted the open education movement which is based on the premise that education content can be packaged, automated, personalized and delivered at scale and at low cost. However, there remains concerns about the effective use of technology to access education content, which can be negatively affected by unsuitable, one-size-fits all products.

2.2.1. Khang Panya Lao (KPL)

One of the key interventions by the Government of Lao PDR to support online learning during the COVID-19 pandemic was the introduction of the Kang Panya Lao (Wisdom Warehouse, in English) digital platform. The platform can be accessed via the web or an app to allow for offline learning. It was developed with the support of development partners to (UNICEF, n.d.):

- Facilitate learning during periods of school closures and as a supplementary learning resource for classroom-based and home learning

- Support professional development of teachers, school and system leaders with resources for blended training approaches
- Enhance the digital skills of children, young people, teachers and technical staff

The Lao Research Institute for Educational Sciences (RIES) in collaboration with UNICEF is responsible for the development and maintenance of KPL and works with 14 development partners who contribute content for the platform. The platform was initially conceived to host learning resources for students during COVID-19 but has gradually become a training resource for teachers' professional learning. Khang Panya Lao is modelled on the Learning Passport, which is a collaboration between UNICEF and Microsoft originally developed to support continuity of learning for displaced and refugee children. The platform is also designed to be an interactive learning space to allow for monitoring user progress and issuing of course certificates upon completion. It is intended to be paired with other software applications such as Google Meet, Microsoft Teams, Zoom and WhatsApp to facilitate greater engagement between teachers and students. According to UNICEF, the platform has reached all 18 provinces in Lao PDR with over 117,000 registered users, 10,000 of whom are teachers. However, it is estimated that the number of users could be as high as 360,000 as the platform is mostly accessed in the classroom and by family groups. According to a UNICEF representative, analytical data shows that the majority of students who use the platform are in transition grades (at the end of primary, lower secondary and upper secondary), as Kang Panya Laos was initially designed to support students in preparing for their transition exams during the COVID-19 school disruptions.

While there has been significant government and donor investments into the development and implementation of KPL, there are still challenges in ensuring the platform is purposeful as a flexible modality for teaching and is accessible for all learners. Interviews with education stakeholders suggests that KPL is not as widely accessed as the data suggests and challenges relating to internet connectivity, lack of devices and digital skills inhibit the efficacy of KPL in the school and home settings. Adoption of the platform is not widespread across many districts due to a lack of awareness and training. According to one district education officer 'almost all teachers in the province don't know about this website'.

The useability of the platform is also limited by download speeds, which can take a long time to open a webpage and view its content. This has implications for using the platform as additional resources for teaching in the classroom. One technical staff member questioned the purpose of KPL as a platform for storing digital textbooks, which offers little value for teachers. Due to the constraints identified at the school and community levels, the potential of KPL is not yet fully realized and will require greater investments in the ICT environment (including infrastructure and digital skills) to improve its functionality and encourage broader user adoption. MoES continues to work with development partners and the private sector to make KPL more accessible to primary schools across Lao PDR, for example, through the provision of tablets with pre-paid sim cards.

2.2.2. Library for All

The ‘Library for All’ project provides an example of an effective way in which technology has been used to facilitate literacy development in Lao PDR. In partnership with ChildFund, ‘Library for All’ provides high quality digital books and educational resources for children in 18 schools in Houaphan province. Schools are provided with tablets pre-loaded with learning materials to help improve the literacy outcomes of students. The program has been largely successful with many schools reporting improved reading proficiency and learning engagement (Panyaphone, 2022). Teachers have also noticed a drop in student absenteeism of up to 30 percent on days when ‘Learning for All’ activities are conducted (Panyaphone, 2022). Students are more engaged when using the tablet to read, which has improved their vocabulary and Lao language skills by up to 27 percent. The content is accessible for all learners, with some teachers reporting it as effective tool for advanced readers, while others have successfully used it to develop the skills of early readers. Some challenges were identified by schools relating to difficulties of ensuring all devices were charged and securing them when not in use.

3. Quality: Teaching and learning

Technology has the potential to enable more effective teaching and learning and improved educational outcomes through the application of hardware and software. To better support learning, a hardware system must be guided by digital architecture that is integrated and scalable from the classroom to school and school to regional levels (UNESCO IITE et al., 2022). The availability and functionality of hardware, such as servers, modems, computers and smart devices, are also essential to facilitate technology-enabled learning but must be considered in relation to context and user capability. Good learning design that incorporates pedagogy with technology enables skill acquisition and practice, which can enhance collaborative learning and student engagement. Software, if well designed, can help students learn in more effective ways through closed applications such as simulations and interactive quizzes, and open applications such as email and word processing (UNESCO, 2022). Specific tools such as chat (e.g., WhatsApp), discussion boards and co-learning spaces (e.g., padlet and jamboard) have been found to help with cultivating social connectedness and group task performance, which led to positive learning outcomes (Chen et al., 2018).

Many studies have also demonstrated that technology can be used successfully to support students with disabilities. For example, game-based learning has been found to have some impact upon language learning and vocabulary development in students with disability (Dabrowski et al., 2020). However, there is also growing concern about the use of mobile phones and artificial intelligence software as pedagogical tools, and questions are raised around their capacity to distract student learning in the classroom and the potential for plagiarism. With the increasing opportunities afforded by artificial intelligence, students will need the skills to engage with it more effectively, such as creativity, critical thinking and collaboration. The digitalization of the education system requires appropriate hardware and software infrastructure to fully support student learning, however, for many low and middle-income countries, meeting that requirement is a key challenge.

The Government of Lao PDR aspires to establishing an ICT-supported education system by 2030 to improve the quality of education outcomes, through a commitment to allocate an increasing budget in the ESSDP (Ministry of Education and Sports, 2021c). As Lao PDR embarks on the process to integrate ICT into the education sector, investments in infrastructure and content development are a crucial first step. At the same time, the Government of Lao PDR is also making steady progress in preparing teachers and students for a digital future with the introduction of a new curriculum focused on student-centred approaches and active learning to support the development of skills to engage more effectively with technology. Through the gradual introduction of the curriculum reform process, teaching practice has improved, with greater teacher confidence observed in the use of active teaching techniques to support student collaboration, play-based learning and formative assessment (Wong et al., in press). In the same study, student literacy skills were shown to improve slightly, along with positive shifts in student attitude and dispositions toward learning.

3.1. Hardware to support teaching and learning

3.1.1. Digital infrastructure at the national level

Investments in hardware to facilitate efficiency in the administration and management of government services has improved over the last few years. According to the Lao PDR Digital Maturity Assessment, government offices across 95 percent of ministries and 88 percent of provinces have adequate and basic computing software such as video conferencing equipment (Mukherji et al., 2022). Other initiatives undertaken by the government to upgrade the ICT infrastructure include: creating the Lao National Internet Centre to improve implementation and operationalization of telecommunication and internet services across the provinces; development of the National Internet System; establishment of the National Data Centre; and the roll out of the National Electronic Signature Verification system (Mukherji et al., 2022). However, investments in equipment and infrastructure have been largely funded by development partners (e.g., UNICEF, UNDP and WHO), bilateral partners (e.g., Government of Vietnam) and the private sector (e.g., Huawei). Budget constraints within the government has resulted in a shortage of new and updated devices and lack of maintenance of existing equipment across all government ministries and provincial offices (Mukherji et al., 2022).

In order for Lao PDR to move forward with the digital transformation of its economy, investments in high-speed and high-quality broadband will require a combination of investments as well as regulatory incentives (World Bank, 2022). Experience from other countries suggests that successful digital transformation in the public sector requires the preparation of common standards and guidelines to facilitate better integration of digital services across all government agencies (Regional Innovation Centre UNDP Asia-Pacific, 2022). With the support of UNDP, the Government of Lao PDR has developed a Government Enterprise Architecture and an eGovernment Interoperability Framework to support a centralized approach to the delivery of e-services for improved efficiency, build trust in government services and support digital inclusion for all users.

3.1.2. Digital infrastructure at the district and school level

Digital infrastructure to support learning at the school level is variable, depending on location and resourcing. Through the support of development partners, the MoES is ensuring that all students have an opportunity to access multiple modes of learning through the provision of digital devices and equipment. For example, in order to support accessibility and reach of the Kang Panya Lao platform, the MoES is providing tablets, laptops, Smart TVs and projectors to targeted schools across the 40 priority districts. However, feedback from some district and provincial education offices indicate that user training is not well targeted and the lack of internet connectivity and speed in some rural areas present challenges for the effective implementation of digital devices in the classroom.

The MoES is also committed to improving education planning and management through the provision of digital infrastructure and resources to all district and provincial education offices. While this top-down approach has seen a more efficient distribution of digital resources to the district and provincial levels, the introduction of equipment at the school level is still limited with many schools in Lao PDR lacking access to computers, Wi-Fi routers, or photocopiers. In a survey conducted by the Basic Education Quality and Access in Lao PDR (BEQUAL) program, all staff at the District Education and Sports Bureau (DESB), Provincial Education and Sports Service (PESS) and Teacher Training Colleges (TTCs) reported having access to the internet and over 85 percent have access to devices including video conferencing equipment, laptops and other ICT equipment (BEQUAL, in press). However, access and use of devices is still a barrier in rural areas due to limited and aging equipment. As one district education officer noted: 'there is an old laptop and printer shared across the division and it is only used for sending data to the PESS'.

Where there is a gap in government provision of resources, some donors are supplementing ICT needs at the school level. For example, the Action Education in Laos ICT Project provides equipment including tablets and projectors to facilitate classroom learning. The tablets are pre-loaded with literacy and numeracy content and the E-classroom app to help students develop digital skills. Teachers reported integrating one to two hours of ICT learning into their lesson plans each week to engage students in interactive activities and encourage collaborative learning (Action Education, 2023). However, donor projects tend to be limited to a few schools or districts and does not have a broad reach across the country, which has implications for scalability and project sustainability. The full integration of ICT in the education system requires concerted investments from both the government and donors to ensure that technology for teaching and learning reaches all schools rather than reinforce the digital divide.

For teachers, the most accessible digital devices used for teaching are desktop computers, followed by smartphones; while students are more likely to have access to a smartphone, followed by a laptop at home (SEAMEO, 2021). This trend is consistent with other countries in the Southeast Asia region. For students with access to the internet or devices, the most common activities were for studying (36 percent), socializing with friends (32 percent) and leisure (26 percent) (SEAMEO, 2021). In a survey conducted by BEQUAL, teachers were more likely to use their personal internet account than school-provided internet (BEQUAL, in press). Approximately half of the teachers and school principals reported having access to tablets or laptops, although only half of them knew how to

use the technology (BEQUAL, in press). It is not clear if this is due to an absence of digital skills or a lack of motivation to use digital devices to support teaching practice.

3.2. Software to support teaching and learning

The Government of Lao PDR has introduced several software initiatives to prepare Lao PDR for a digital future. This includes the establishment of the e-Government portal to facilitate electronic public administration; installation of a video conferencing and government email system to all sectors at the central and local levels; development of a common government cloud-based platform administered by the National Internet Centre; the creation of a government messaging application G-Chat to promote secure communication exchange within government; and the construction of a National Data Centre for the management of government document and personnel information (Government of Lao PDR, 2021).

Despite some of these initiatives being rolled out across ministries at the central, provincial and district levels, not all education officers report using government platforms for educational administration and management functions. Open-source applications such as the Google Suite are more commonly used by ministry, technical staff and teachers. In one province, Google Drive is used to store and share all digital assets from the central to the district level. Despite a centralized messaging platform developed by the government, the use of WhatsApp, Facebook and Zoom were reported as the preferred channels for information exchange and communication between education officers. This is similar to the experience in other education systems in the Southeast Asia region where communication platforms such as WhatsApp has been shown to be an effective tool for teacher collaboration during the COVID-19 pandemic (Dabrowski et al., 2022). According to a survey of Lao Teacher Training College staff, provincial and district education officers who participated in the Australian Strategic Partnership in Remote Education[3] (ASPIRE) program, 100 percent of respondents stated that the program allowed them to continue to connect and collaborate with a range of colleagues across geographical areas and disciplines (Monash College, 2021).

There are some examples of effective use of software in the classroom and at the school level to facilitate teaching and learning at all levels. Sixty-nine percent of teachers who were surveyed by BEQUAL (in press), reported that they use the teacher development videos and audio materials and accessed this content through YouTube (86 percent), QR codes (67 percent) and USB (54 percent) (BEQUAL, in press). However, staff involvement in the development of teacher training video content was low at the provincial and district levels, which was 14 and six percent, respectively. Teacher Training College staff and pedagogical advisors who participated in ASPIRE workshops, reported an improvement in their understanding and knowledge of collaborative learning (Monash College, 2021). The most commonly cited reason for this change was attributed to the immersive experience that participants themselves had during the workshops and the benefits gained during collaborative activities. Participants also noted

[3] The ASPIRE program was funded by the Australian Department of Foreign Affairs and Trade in response to a request from the Lao Ministry of Education and Sports to upskill teaching staff with digital pedagogy. Based on a train-the-trainer model, the program was conducted via interactive workshops through the use of an online learning management system (LMS) Moodle.

that the range of technological options can help facilitate collaborative learning beyond the traditional student-teacher or student-student relationships to include family or community members (Monash College, 2021).

While there was a lack of evidence on the impact of technology use to facilitate learning for school-aged children, teachers, principals and educational staff who have access to technology-supported teaching and learning report improved skill and knowledge. In particularly, teacher skill and confidence with using software in the classroom was more evident in the higher education sector. One lecturer at the Teacher Training College reported regularly using Google Classroom as a learning management system as a tool for sharing content, student assessments, communication and collaboration.

4. Quality: Digital skills

As a result of the pandemic, learners and teachers are increasingly reliant on technology for teaching and learning purposes. However, as access to technology has increased, a number of challenges have also emerged. Research shows that in many contexts (Dabrowski & Nietschke, 2021), the potential for technology to effectively support learning is often reduced because of a lack of digital literacy at the student and teacher level. However, there remains little research on the way in which these skills are developed and assessed as part of broader curricula and teacher training, including in Lao PDR.

Digital creativity and innovation are recognized by the Government of Lao PDR as crucial for the social and economic development of the country. The NEDP 2021-2025 recognizes the "use [of] digital technology and innovation to facilitate learning, including 21st century skills such as problem-solving skills, cognitive skills, collaboration-communication, creativity and innovation skills, personal responsibility, social skills, and understanding of international cultures". They are also necessary skills required of a population to advance global competitiveness (SEAMEO, 2021). In Lao PDR, a focus of the new primary curricula (Grade 1 to Grade 5) is to incorporate pedagogical approaches that prioritize student centred learning and the development of 21st Century skills. The Education and Sports Sector Development Plan 2021-25 defines 21st Century skills as encompassing critical thinking, problem solving, collaboration and communication, creativity and innovation, information media and technology literacy, ICT literacy, social and cross-cultural skills, personal responsibility, self-regulation and initiative, and metacognitive skills. While the new primary curriculum does not include specific content on digital skills or the use of technology, a new subject 'Science and Environment' was introduced. This subject included the provision of teacher guides and materials to support teaching such as magnets. Teachers are also provided with USB devices loaded with teacher development videos on new teaching techniques as well as audio of Lao and English stories that could be used as teaching aids in the classroom. However, the existing secondary curriculum includes a specific subject 'Technology and ICT', but according to a MoES official 'the secondary curriculum is too ambitious because teachers are not well trained to teach the subject content'.

The primary curriculum reform process which introduces new pedagogical approaches to learning is an important step in promoting student skills that will help them to navigate the digital world. To supplement classroom learning, the MoES also launched the first ever 'Digital Literacy Camp' for students in Lao PDR (UNICEF, 2023). In this camp, students were introduced to tablets, the national e-learning platform, Khang Panya Lao, and important topics like online safety. The specific learning needs and priorities of students, particularly girls, were a focus of the camps.

4.1. Student capability to use technology

In Lao PDR, only a minority of students receive digital skills education (Voelker, 2021). Parental education and skills play a critical role in the development of student's digital skills such as critical thinking and self-regulation (Chase, 2010). However, many Lao students from low socio-economic backgrounds have parents who are illiterate and are unable to support their learning (Wong et al., in press). This is also compounded by a lack of access to technology to practice any digital skills that they may acquire at school. It has been acknowledged that the use of modern technology in education is limited in Lao PDR, and digital literacy remains low, among both students and teachers (Global Partnership for Education, 2020), and particularly among girls (UNICEF, 2023). Of the research that has been undertaken on student proficiency in using and developing digital skills, the findings are often conflicting or inconsistent.

The World Bank (2022) considers Lao PDR to be a young nation with a large proportion of digital natives. However, studies of children and adolescents offer an alternate perspective. Research suggests that students in Lao PDR assess their digital literacy as moderate, however 61 percent of students aged 10-24 years old in Lao PDR reported not learning any digital skills at school (Voelker, 2021; UNICEF, 2023). A regional UNICEF survey on digital literacy in education suggested low levels of access to technological devices is the biggest challenge for young people in gaining digital literacy throughout the region.

Access to devices is a major barrier to children's proficiency in developing digital skills, and this access is often gendered (UNICEF, 2023). In a study of 15 year-old children in Lao PDR, four percent of students reported that they had never used any devices, while 11.3 percent had used a device for less than a year (SEAMEO, 2021). These trends continue into adolescence and adulthood. According to the 2017 Lao Social Indicator Survey (LSIS), the most recent major household survey, only 11 percent of young men and nine percent of young women (aged 15-24) engaged in at least one ICT activity in the last three months (UNICEF, 2020). The types of ICT activities reported by respondents include copying or moving a file/folder, used a copy or paste tool, sent email with an attachment, used basic formula in a spreadsheet, connected and installed a new device, downloaded and installed a software, created an electronic presentation, transferred a file between a computer and another device, and wrote a computer program (UNICEF, 2020).

As noted earlier, survey data gathered in Lao PDR reveals that children's ability to use technology in different ways varies (SEAMEO, 2021a; SEAPLM, 2019), and is again often influenced by a student's gender. The SEAMEO Digital

Kids Online Survey[4] for example, examines proficiency in children's digital skills, including resilience, creativity and innovation. The results suggest that children in Lao PDR need support to improve their capacity to navigate the digital realm, and that many lack the required creativity and innovation to effectively undertake tasks online. The same survey also indicates gendered differences in children's ability to navigate digital spaces. Girls have significantly higher scores relating to Digital Safety and Resilience[5], but boys have significantly higher scores on both Digital Emotional Intelligence and Digital Creativity and Innovation. There is no difference between girls and boys in terms of the Digital Literacy and Digital Participation and Agency domains.

The results appear to show that children in Lao PDR, consistent with students in comparable countries in the Asia-Pacific region including Bangladesh, Korea, Vietnam and Fiji, need ongoing assistance in developing diverse digital skills. The results also seem to suggest that while girls are developing their capacity to navigate online spaces safely, boys are developing their digital citizenship skills (SEAMEO, 2021). These differences may be attributed to the disparate access to technology of male and female students in Lao PDR, like many other countries in Asia (Dabrowski et al., 2022), and the different levels of support afforded to students based on gender.

4.2. Family Support for technology

Research suggests that learning digital skills are shaped by multiple stakeholders. While teachers still play an important role in the development of digital skills amongst Lao learners (SEAMEO, 2021), self-learning and learning from siblings and peers is increasingly common in Lao PDR. Research also shows that parents are crucial in supporting the development of students' digital literacy skills and involving parents and caregivers in student learning has a greater impact on improving student outcomes than socioeconomic status (Desforges & Abouchaar, 2003; Goldman, 2005). However, the percentage of children under five years of age experiencing a positive and stimulating home learning environment varies widely. Activities such as parents reading or looking at picture books; telling stories; singing songs; taking children outside the home; playing; and naming, counting and/or drawing, are all indicators of readiness to study in a smart educational environment (an environment which uses technology). Family support and a supportive learning environment is also predictive of the development of digital skills (UNESCO, 2022b), which continues to be a barrier for many children in Lao PDR and the transition to smart schools at the country level.

4.3. System capacity to support digital skills

The Lao ESSDP (Ministry of Education and Sports, 2021c) aims to improve the quality of upper secondary teaching and learning to meet the need of the labour market and higher education, and there is a strong focus on improving the capacity of schools and students to use and integrate ICT, including the production and use of online and

[4] This survey offers an attempt to assess "children's attitude, behaviours, competency levels, and use of ICT when engaging with the Internet or digital technologies in their everyday lives" (SEAMEO, 2021), and draws on data from Lao PDR as well as other comparable contexts. It was developed by the Institute of School Violence Prevention at Ewha Womans University, South Korea, in consultation with UNESCO Bangkok and will be further developed through pilot research by partners in Bangladesh, Vietnam, South Korea, and Fiji.

[5] Digital Safety and Resilience is defined in the study as "an individual's ability to protect himself or herself and others from harm in the digital space". The survey measures understanding of children's rights, knowledge of personal data/privacy/reputation, promoting/protecting health and wellbeing, and practising digital resilience.

blended learning materials. Enhancing staff and educator capacity at all levels is also a key priority. However, ministry capacity, as well as structures that support the implementation of these goals appears to be a major challenge for Lao PDR. The ESSDP includes references to including teaching and learning of cognitive and socioemotional skills in primary and higher education, however, there is a lack of integration of digital skills within teaching and learning practices (World Bank, 2022). Indeed, the ESSDP policy framework does not clearly outline a pathway towards improved digital skills of students. There is currently no ICT or digital education masterplan in place, and the new National Quality Framework does not include references to digital skill development.

The World Bank (2022) suggests that the public sector in Lao PDR lacks digital maturity in skills. A regional study of national and provincial bodies' digital maturity in late 2021 and early 2022 rated Lao PDR's country-wide maturity level on a scale from 'digitally nascent' (1) to 'innovative' (5). Its average score was 1.7, with skills and capacity building the lowest scoring of six pillars. Similarly, a 2021 assessment undertaken by the Ministry of Education and Sports (2021) revealed that the current capacity of ICT staff across MoES departments to administer, maintain, and develop software and associated systems poses a major challenge for developing digital literacy in Lao PDR's education system. As Mukherji (2022) notes, there is a lack of a formal ICT 'digital masterplan' for the education sector to improve workforce capability and support national digital competitiveness, suggesting that organizational readiness remains emergent. There is also a lack of ICT/digital-focused TVET and skills development programmes to support long term ICT integration and post-schooling trajectories that require digital skills to be competitive, as one UNICEF staff reported:

> **The key issue faced by the implementing team both at UNICEF and MoES is the limited IT skills of the [education] technical team and those IT support persons don't know the curriculum. Administrators of the app need to have adequate IT skills and [knowledge of] the curriculum…MoES doesn't have staff with strong enough ICT knowledge and skills to move forward the digital learning initiative.**

While 60 percent of ministry/provincial employees have been identified as competent in basic ICT/digital skills (Mukherji, 2022), sustainability and continuous improvement remains a challenge. Retention of suitably skilled staff in the MoES is cited as particularly problematic for building and sustaining ministry capacity. This may be because only 20 percent of ministries have established clear, structured career paths and incentives to pursue digital government functions, and no clear recruiting strategy exists to attract ICT/digital talent. Further, 60 percent of ministries/provinces provide ICT/digital training and change management programmes, and only 10 percent of ministries conduct formal onboarding programmes, and less than five percent of ministries/provinces provide ICT/digital certification or accreditation (Mukherji, 2022). Concerns around retention and capacity were also echoed by several key stakeholders in Lao PDR:

It is difficult to find and keep staff with IT skills, they often move to the private sector where they can earn more money. They are a very limited number of employees with high IT skills. All systems are self-hosted in ministries, so problems are multiplied across each ministry.

There's no IT technical person in both ministries (MoES & MTC). Whatever platform is developed; they are not sustained because of the lack of maintenance…providing devices should come alongside training and introduction to how to use them.

Communication between key stakeholders involved in developing ICT is fragmented across the education sector. Multiple platforms such as WhatsApp and text messages are used for internal communication across all government offices, and there is limited use of the centralized Government messaging app G-Chat (Mukherji et al., 2022). A development partner expressed concerns that current MoES IT support systems often do not work effectively.

What is clear is that [MoES] do not have an integrated planning system with IT, and MoES has a lack of capacity to manage this, so development partners are hiring IT consultants to do this. This looks very problematic… no sustainable solution within MoES to integrate systems to make this work properly.

Findings from the 2021 survey indicate that the ICT capacity of MoES staff is weak to the level that it risks the sustainability of platforms that are currently under development, including both the Education Management Information System (EMIS) and the Lao Education and Sports Management Information System (LESMIS) platforms (Ministry of Education and Sports, 2021a). This finding, in combination with those on the assessment of the ICT infrastructure (hardware and software), threatens the daily functioning and sustainability of the different ICT initiatives under development. Responding to these challenges and taking a long-term view of developing a sustainable system for MoES across different departments is still needed (Ministry of Education and Sports, 2021a).

In order to address some of these challenges, the World Bank (2022) has suggested that Lao PDR could promote digital leadership at the government level by conducting an in-depth assessment of digital skills and learning needs of government ministries, starting with a pilot ministry. With digital skills becoming more relevant, the MoES and MTC could also establish a working group with a mandate to develop a masterplan for digital skills (World Bank, 2022). Finally, a more holistic approach to improving digital skills across the lifespan could be supported with more focus on Technical and Vocational Education and Training (TVET) and Non-formal education (NFE).

5. Access and quality: Higher education

The tertiary sector has led the adoption of technology in delivering education, aimed at expanding the reach to a broader population of students for whom traditional and mainstream approaches may not be appropriate. Well-intentioned learning design that is high quality and engaging can have a positive impact on learning experiences. Over two decades of research on the effectiveness of online learning has shown that when students and teachers have the right conditions for the application of online learning (such as training, tools and skills) older students retain more knowledge than compared to face-to-face learning (Dabrowski & Nietschke, 2021). Blended learning is also a common approach used in the higher education sector where students engage in a mix of on and off-campus learning. There is some evidence that blended learning may be as effective as classroom learning for many students (Brown et al., 2020). Despite the wide adoption of technology in the higher education sector, academics and practitioners warn that learning design should not only be an exercise in technology use but a problem-solving exercise that supports differentiated approaches to learning that is responsive to the context, purpose and needs of students (Dabrowski et al., 2020).

5.1. Policies supporting technology in higher education

One of the key drivers of a digitalized economy is the development of digital skills, especially at the tertiary level. The MoES and the Ministry of Labour and Social Welfare are the two government agencies responsible for the development of skills and preparation for a digital workforce (World Bank, 2022). The 9th National Socio-Economic Development Plan (NSEDP), 2021-2025 mandates the use of ICT skills in teaching and learning at the secondary and tertiary levels, while at the primary level it prioritises the development of cognitive and socioemotional skills in all students (Government of Lao PDR, 2021).

In line with the NSEDP, the MoES is specific about using ICT to improve the quality of education at the upper secondary and tertiary levels to meet the needs of the labour market. In particular, one of the policy objectives of the Education and Sports Sector Development Plan (ESSDP) 2021-2025 is to 'promote and develop technology related programmes, including Artificial Intelligence (AI) study programmes for university students, especially those undertaking natural sciences program so that the number of natural sciences students increases' (Ministry of Education and Sports, 2021c). It proposes to achieve this by working with the National University of Laos (NUOL) to increase the number of enrolments and graduates through initiatives including: establishing a new Institute of Technology including an AI Centre; organising AI events and competing at the regional and international levels; promote and protect intellectual assets of students; and improving ICT infrastructure. The MoES is also developing its own ICT policy as part of the National ICT Policy.

At the same time, the Ministry of Communication and Technology operates an ICT training institute and has recently signed an agreement with China Railway Construction Group Co. Ltd for a new building which will be equipped with ICT equipment, teaching and learning materials, laboratory equipment and assessment facilities (World Bank, 2022). The MLSW is also establishing its own ICT training institute with the support from the Republic of Korea to train workers in ICT skills (World Bank, 2022).

Despite a national framework for ICT training and skills development, there is no digital education masterplan in place and a lack of a clear pathway for how the Government of Lao PDR will allocate resources and target funding to develop a workforce with the knowledge and skills to contribute to a digital economy. There also appears to be a lack of coordination across the line ministries, with each proposing its own strategies with the support of different donors. However, there may be an opportunity to improve coherence in the sector with the MLSW planning to conduct a review of existing ICT-related education programmes in line with current and future workforce demands (World Bank, 2022). This could also help align various donor programmes with government priorities and improve the planning of digital skills training activities of tertiary and vocational training institutions.

5.2. Digital skills and higher education

There is a high demand for digital skills training in Lao PDR. A recent feasibility study found that 87 percent of survey respondents would be interested in using online learning to improve their skills and 54 percent would like to access online vocational skills training (World Bank, 2022). The ESSDP promotes the introduction of alternative pathways for lifelong learning and digital skills development that includes flexible learning, non-formal education and vocational education using online training courses (Ministry of Education and Sports, 2021c). However, digital skills training in Technical and Vocational Education and Training (TVET) and Non-formal Education is not yet integrated as part of the curricula.

5.3. Technology enabled teaching and learning in higher education institutions

Both public and private higher education institutions and colleges adopt varying degrees of technology for teaching purposes. This is also dependent on the level of resourcing, teacher competency and motivation. According to the 2022 Higher Education and e-Learning in ASEAN Trend Report (ASEAN Cyber University Secretariate, 2022), the main challenges impacting effective online teaching and learning at three universities in Lao PDR, were related to (ACU Secretariate, 2022):

- the inadequacy of the ICT infrastructure with low bandwidth and weak internet connection and old equipment to support online learning;
- lack of teacher digital skills in preparing online content, delivery and assessment;
- lack of student digital skills in enrolling and accessing online courses;
- teachers' low perception of student ability and lack of trust in student learning outcomes; and
- lack of student motivation to engage with teachers and other students online.

Since 2012, the Government of South Korea has been supporting the Department of Higher Education to improve online learning capabilities at public universities. This includes the upskilling of faculty members and staff in instructional design, multimedia and content development, the development of content for 23 subjects, and provision of ICT equipment and software to support online learning such as student management and support systems, e-library and learning management systems (e.g., Moodle). Between 2015 and 2019, the number of students who were enrolled in online courses ranged between 373 to 518 (ACU Secretariate, 2021). Despite some

progress in ICT capacity and adoption over the last decade, the COVID-19 pandemic revealed key challenges for online learning across many public universities including, lack of adequate digital skills or familiarity of teachers and limited software and hardware to support online learning (ACU Secretariate, 2021). Teaching staff also reported difficulties in assessing student achievement during online learning and had no confidence in student learning outcomes (ACU Secretariate, 2021). Therefore, teachers have requested further development in the use of digital tools for online assessment such as software for citations.

Adequate and appropriate resourcing is critical for effective delivery of online teaching and learning. As one interviewee noted, funding from the Government of South Korea has ensured that the Korean Language Department at NUOL is well resourced with digital devices to facilitate teaching and learning, such as LCD projectors, desktop computers and high-speed internet. The availability of quality devices and access to high-speed internet allows students to use Google and Youtube to download lessons or search for new topics, making learning more adaptable to the needs of different learners. It also creates opportunities for the transfer of knowledge and sharing of resources with other Korean language students in the region and around the world. Lecturers also report using Google Classroom as the most common platform for managing student assignments and assessments. Some instructors also report effective use of software such as Google Form and Kahoot for developing quizzes and assessments, as well as a way to enhance student engagement and interaction in the classroom.

5.3.1. Mobile learning in higher education in Lao PDR

With the wide adoption of mobile technology in Lao PDR, this offers the opportunity for scaling mobile learning across the higher education sector. The use of mobile technology has the potential to enhance the quality of teaching and learning by providing flexible and differentiated approaches as well as support student engagement through social connection and collaboration. In a study examining the impact of mobile technology to facilitate teaching and learning in the Faculty of Agriculture at NUOL, it was found that mobile phone ownership was playing an important role in contributing to student learning (Starasts et al., 2016). The study reported that students were using their smart phones to communicate with their lecturers and for sharing lecture notes. Access to social media has also been found to enhance learning, with Facebook the most commonly used platform for communicating among the student group and for uploading learning materials (Starasts et al., 2016).

However, the study found that accessibility and adoption of mobile learning is not widespread at NUOL. While many most students enrolled in the Bachelor program in the Faculty of Agriculture have mobile phones, many do not have the digital skills to use them effectively for learning (Starasts et al., 2016). Access to educational activities on mobile devices are also restricted due to cost and availability of a reliable internet, with only one publicly available Wi-Fi connection in the Faculty. At the time when the study was being conducted, NUOL was setting up a learning management system using the Moodle software to deliver lectures and learning content online. However, limited student access to computers and mobile devices was a significant barrier to its implementation across the university. Rural students and those from poorer households were particularly disadvantaged due to their lack of

ownership and access to devices. This created a challenge for lecturers to fully incorporate digital content in their course delivery and sharing lecture notes or communicating with students online, while ensuring equitable access to educational activities for all students. The limitations with access to devices, combined with a lack of digital skills of both students and lecturers presented a significant constraint to the broad adoption of digital resources and processes to supporting mobile and online learning at NUOL (Starast et al., 2026). If higher education institutions are key to developing a population with digital skills and innovation to drive productivity and growth in Lao PDR, additional resources to the sector are needed through better equipment, staffing and training in order to support the full integration of technology-based teaching and learning processes.

5.4. Challenges with technology in higher education

The lack of functional devices and tools for learning and reliable, low-cost internet access is still a barrier for many students attending higher education institutions. The lack of resources is experienced at both public and private higher education institutions, where there are is no foreign assistance or bilateral partnerships. Budgetary constraints mean that internet access is limited and instructors don't have the right equipment or devices to teach with. According to one respondent, poor internet connectivity makes it difficult and frustrating for engaging students through online learning, where it may take up to 15 minutes to log on and screen sharing is often frozen. At one institute, there are only enough computers to accommodate less than five percent of students. There are also increasing concerns around online safety and the lack of awareness or regulations to protect students.

While the availability of free and cost-effective content and software has enhanced teaching and learning practices at the higher education level, there is an acknowledgement that learning resources should be developed and managed through a centralized system to ensure consistency and quality. There are currently no policies or regulations guiding teachers on the use of technology for teaching and learning purposes. A few lecturers have called for greater investment by government into the development of a learning management system for universities and higher education institutions to enable more effective planning, documentation and monitoring of student learning.

6. Education management

Governments rely on a system of tools, processes and structures to make administrative and operational decisions about education delivery and services. This requires information and data that is available at the district and central levels to support the planning and mobilization of resources such as teachers, infrastructure, equipment and materials. Under the EU-supported Partnership for Strengthening the Education System in Lao PDR, UNICEF is assisting the MoES with the development and piloting of LESMIS. The platform uses GIS-enabled data visualization and aggregation to support decision-making for education planning and management by the MoES, district and

provincial offices and development partners (UNICEF, n.d.). LESMIS is linked to the ESSDP to ensure the effective use of data for planning, budgeting and systematic monitoring.

LESMIS collects and processes school information based on the Fundamental Quality Standards (FQS), which tracks school development efforts aimed at improving student learning outcomes. FQS 1 covers basic infrastructure and inputs including textbooks and teacher education. FQS 2 covers school management and teaching-learning environment indicators. FQS 3 consists of curriculum standards and represent short tests of basic skills in Lao language and mathematics that are applied to students. Schools conduct FQS 1 and 2 in the beginning of the school year, and FQS 3 is completed after each semester in all grades for all students. The data is used as part of the Self-Assessment (SA) and School Development Planning (SDP) processes, where the information from FQS 1, 2 and 3 is used to define priorities and actions (in the SDP) that are then linked with funding from the School Block Grant (SBG).

The FQS is a technology-enable process, which allows schools to use online questionnaires or input information on a tablet. Data is collated and processed by LESMIS and schools are assigned a red, yellow or green code to identify the level of need. This allows district and provincial education staff to access data on schools in a timely manner and prioritize support to schools. LESMIS displays the information on a dashboard that is in the form of a report card back to the school and community as an accountability measure. Currently, five districts are piloting LESMIS with support from UNICEF. Each district in the pilot receives ICT hardware (such as laptops/tablets and Wi-Fi routers), training for district and provincial staff, and resources for school principals to come to the district for training. Some districts which are not included in the pilot have taken the initiative to become involved in the trialling of LESMIS through the adoption of an online system for tracking student enrolment and monitoring student attendance in their schools.

While LESMIS has the potential to transform education planning and management through real-time data collection and reporting, there are some challenges related to the ICT infrastructure and capacity of users in the implementation and adoption of LESMIS. As one provincial education staff noted, schools are completing FSQ1, 2 and 3 via hard copy and entering information into a tablet offline. The data is then uploaded when the tablet is connected to the internet. There are also concerns raised about the validity and accuracy of the data as FQS/LESMIS is a self-assessment process and there is currently no clear external verification mechanism in place.

Another key challenge for LESMIS is the lack of digital skills from teachers and principals in using a computer or tablet for data collection. The issue is compounded by the lack of resources to send principals and teachers for training at the provincial level. While capacity at the district and provincial levels are adequate, school staff generally lack the ICT skills required to collect FQS information and upload the data onto the LESMIS system.

There are also some design and technical issues related to the LESMIS system, which includes difficulties interacting with the LESMIS home server based in Australia and instability in the functionality of the system which makes

interactions on the system appear slow. However, this was observed by a Ministry staff member as a capacity issue related to the quality of ICT support staff and designers.

Since the onset of the COVID-19 pandemic, the development of the Khang Panya Lao platform has provided the MoES with a central knowledge management tool for the storage of educational content and teacher training courses. To date, Khang Panya Lao has already been used to support online learning and teacher capacity building for in-service educators. Although the application acts as a medium for learning, it has also become a tool to help teachers to develop their own academic and pedagogical skills. UNICEF has supported MoES to use Khang Panya Lao to support teacher professional development, with use of the platform intended to promote online learning that also supports digital literacy of teachers (UNICEF, 2021). Other development partners such as the Australian Department of Foreign Affairs and Trade are also contributing their continuous professional development (CPD) materials to Khang Panya Lao.

However, concerns around the quality of trainers associated with Khang Panya Lao, as well as the ongoing challenges posed by low levels of digital literacy amongst teachers, are likely to impact on the intended uses of the platform. As one UNICEF representative in Lao PDR suggested, the 'ICT skills of Khang Panya Lao trainers are still limited', and low levels of teacher digital literacy are likely to continue to impact the effective use of technology in schools.

Conditions for fulfilling the potential of education technology

7. Availability of technology

There is growing recognition by governments that technology investments in education can help accelerate economic and human capital development through a digitally-skilled workforce that can lead innovation and growth. The COVID-19 pandemic has spurred the pace of government investments in technology as a solution for maintaining learning during school disruptions. It also brought into sharp contrast the vast digital divide experienced by many education systems worldwide. As countries invest more in ICT to transform their education systems into one that is more adaptable and responsive to labour market demand for digital skills, they also need to be more strategic in monitoring how technology investments are transforming teaching and learning, particularly for the most disadvantaged groups in society. This means developing a more sophisticated system of measuring impact on learning beyond basic inputs, such as the number of computers in the school, that can improve the efficiency and effectiveness of systems level planning and management.

Over the last decade, Lao PDR has embarked on a pathway towards digital transformation in an effort to improve the efficiency and transparency of government services. In the education sector, the Government of Lao PDR has committed to expanding quality digital learning for all including: enhancing ICT infrastructure and equipment;

expanding internet access for all schools; supporting the upskilling of teachers in digital and flexible learning approaches; integrating ICT Competency Standards for Teachers in the teacher education curriculum; developing digital resources for online and television learning; expanding AI and STEM in general vocational courses and secondary education; and improving cooperation with the private sector to develop new qualifications in green technology (Government of Lao PDR, 2022). In order to achieve these goals, the Government has also committed to adequate and sustainable financing of the education sector, to meet the 18 percent benchmark under the Education Law.

7.1. Digital infrastructure

Despite recent investments by the Government of Lao PDR and development partners into the country's digital infrastructure, Lao PDR still faces formidable challenges in the provision of equitable and quality education services to all students. The lack of affordable internet connectivity and lack of devices for teaching and learning are two major obstacles for transforming to a digitalized education system. Lao PDR currently ranks ninth out of the 10 ASEAN countries in terms of digital access, affordability and quality of internet services (Mukherji et al., 2022). While mobile phone usage is widespread across the country (96 percent), Lao PDR scores only 43.93 out of 100 points under the GSMA Mobile Connectivity Index which measures the drivers of mobile internet adoption including network infrastructure, affordability and relevance of content and services (SEAMEO, 2021). This also has broad implications for Lao PDR's socio-economic growth and its aspirations to graduate from least developed country status by 2024. According to the World Economic Forum's Global Competitiveness index, Lao PDR has dropped its ranking from 98 to 113 out of 137 countries and earned the lowest score for 'technical readiness' relating to availability of latest technology, foreign direct investment, technology absorption and transfer, internet subscriptions and bandwidth (The ASEAN Post, 2020).

In recent years, China has invested heavily in the development of digital infrastructure in Lao PDR, with hardware provided by Huawei and ZTE and financing of Lao PDR's first satellite and the installation of a fibre-optic network across Lao PDR by the Government of the People's Republic of China (PRC, Runde et al., 2022). However, this over-reliance on Chinese infrastructure also raises some concerns about data privacy due to China's ICT laws (Runde et al., 2022). According to the World Bank assessment of Lao PDR's digital readiness, there is an estimated 92,000 km of fibre optic cables reaching all districts and provinces which represents a well-established network for internet connectivity across the country (World Bank, 2022). It also notes that increasing local caches for the main content delivery networks (CDNs) and local internet exchange point (IXP) positions Lao PDR well to become less reliant on international connectivity and reduce the cost of internet access. However, internet connectivity and access is still prohibitive for most of the population due to unreliability of services and high costs.

In line with the strategic goals of the ESSDP to expand digital access across the education sector, the MoES provides internet access to its district and provincial offices. However, staff from one district reported that 43 people in her office share one Wi-Fi router with only 10 MB of data per month. This limits the amount of internet accessible by

staff for work-related purposes, and they often have to rely on their personal subscriptions to supplement usage. This demonstrates that the investment by the MoES is insufficient to meet the needs for education planning, management and training at the local levels.

Radio, TV and other offline media, such as DVD, SD cards or tablets with digital content stored on it, could be used effectively to deliver educational content. In response to COVID-19 school disruptions, the MoES produced and launched the My House television series for parents and families to support early childhood development. Other television programmes were developed in collaboration the MICT including My Village TV and Learn Together Laos (UNESCO, 2023). However, unreliable electricity supply means that even low-technology applications such as these remain out of reach for many students in rural and remote areas. According to a recent report, as many as half of the schools in Lao PDR do not have electricity (GPE, 2020).

7.2. Coordination and resourcing

While Lao PDR is developing a Government Enterprise Architecture and eGovernment Interoperability Framework to support an ecosystem of streamlined e-services across government services, coordination of technology initiatives across line ministries is still emergent. Currently, each ministry hosts its own server and IT system which creates inefficiencies across the system. Further, there is a lack of ministry staff with adequate ICT skills to manage and maintain system requirements and there is an over-reliance on external technical capacity (usually funded by donors) to support the ministry. In response to these challenges, there are recommendations to move the servers to a central location which can be hosted by the Ministry of Science and Technology data centre (Ministry of Education and Sports, 2021b). This will help ensure data security and reduce the workload on ICT staff in each ministry.

In addition to limited human resource capacity, budget constraints mean that there has been a lack of sustainable funding to progress and expand some of the planned digital initiatives, and donors have played a prominent role in filling the financing gap to develop and implement some of the government's digital projects. Bilateral donors and the private sector are also contributing to the development of the ICT sector, although in different areas. As discussed in a previous section, the Government of South Korea is funding digital skills development at the Ministry of Labour and Social Affairs and tertiary education institutions, while the Government of PRC have invested heavily in ICT infrastructure such as the fibre-optic network. International companies, such as Huawei and Google have also contributed to the development of the ICT sector both financially and through the provision of free access to their software, while cooperation with local companies was prompted by the COVID-19 pandemic. For example, the MoES was able to negotiate an agreement with private telecommunication companies in Lao PDR, such as UNITEL and Lao Telecom, to subsidise internet subscriptions and unlimited data for the use of education-related applications. Discounts of up to 50 percent was offered to DESB and PESS staff and teachers to enable them to access educational content. As a result, there is reportedly continuing conversations with private service providers to take a more prominent role in realizing Lao PDR's vision for digitalizing the education sector, including expanding access to KPL to all primary schools.

While these efforts have been important in advancing the digitalization of government services, they may also contribute to further fragmentation and dilution of a common approach to ICT integration across government. For example, UNICEF is supporting the MoES in the development of the Kang Panya Lao platform, while the UNDP is working with the Ministry of Technology and Communications to implement the G-Room project. This is meant to supplement KPL with video conferencing and interactive applications to facilitate better engagement with students online. As one ministry representative noted 'Due to ineffective coordination between UN agencies and ministries, the project has been further delayed'.

8. Governance and regulations

The proliferation of ICT content and application in education, particularly after the COVID-19 pandemic, calls for greater governance and oversight to ensure that policies, regulatory frameworks and accountability mechanisms are in place to benefit and protect all users. ICT policies and strategies should also be relevant to the education needs of students and be guided by a framework that measures results for quality and equity of learning outcomes for all, rather than the implementation of ICT as an end in itself. The Smart Education Framework, developed by the UNESCO Institute for Information Technologies in Education (UNESCO IITE) identifies five indicators to track the effectiveness of ICT implementation (UNESCO IITE et al., 2022):

1. National education standards should articulate learning goals for what students should know and able to do at each grade level. This allows for personalized learning to be tracked through a data management platform, which provides the precondition for transition to smart education.
2. National level plans shape the practice of personalized learning.
3. Average teacher salary relative to IT professionals with similar qualifications.
4. Government commitment to the transition to smart education through the development and implementation of national plans.
5. Development and implementation of national guidelines and standards for protecting the health and wellbeing of users in the educational digital environment, including considerations for the ethics, privacy and safety of learners.

8.1. National ICT policies

8.1.1. Policies to support digitalization of the economy

Recognizing that Lao PDR is lagging behind other countries in the Southeast Asia region, the Government of Lao PDR has articulated a vision for a digitalized economy to drive economic growth from three percent GDP to 10 GDP by 2024 (World Bank, 2022). This is encapsulated in the National Digital Economy Strategy (2021-2030) and the National Digital Economy Development Plan (2021-2025). As part of this process, new laws have been enacted to prepare for the growth of government digital services, including the Law on Electronic Data Protection and the Law

on Digital Signature (World Bank, 2022). The Government of Lao PDR is also a signatory to the ASEAN Work Program on Electronic Commerce (2017-2025) which facilitates regional e-commerce and help Lao PDR reach larger markets (World Bank, 2022). Through the adoption of new laws and the development of a more robust regulatory framework to support digital adaptation, Lao PDR has gradually increased its ranking on the E-Government Development Index from 167 in 2020 to 159 in 2022 (Regional Innovation Centre UNDP Asia-Pacific, 2022). Other actions taken by the Government of Lao PDR to create a favourable policy environment for ICT adoption include the appointment of the National Internet Management Committee chaired by the Deputy Prime Minister and Minister of Public Security. The role of the committee is to oversee and promote all work related to the digital transformation of Lao PDR, not only in the education sector, but its role includes creating a digital government and digital economy, ICT infrastructure investments and cyber security.

8.1.2. National Socio-Economic Development Plan

The National Socio-Economic Development Plan (NSEDP) 2021-2025 outlines the country's aspirations and strategies for the achievement of its development goals and recognizes the application of modern science and technology as a key driver for socio-economic growth. Importantly, processes are underway to develop legislation such as the Law on Intellectual Property for the registration of trademarks, copyrights and patents, as well as the Law on Science and Technology which will be submitted to the National Assembly for approval (Government of Lao PDR, 2021).

The NSEDP is specific about the application of ICT to improve quality teaching and learning outcomes. The use of digital technology is promoted across all sub-sectors for the administration of education, teaching and learning, curriculum development, and the adoption of digital tools to enable inclusive learning. At the primary and secondary levels, the adoption of technology is encouraged to facilitate the development of 21st Century skills such as problem-solving skills, cognitive skills, collaboration, communication, creativity, innovation, personal responsibility, social skills and international understanding (Government of Lao PDR, 2021). In the skills and higher education sectors, there is a focus on expanding ICT and modern technology courses such as artificial intelligence, to meet the growing demands for a more digitally literate workforce. Improving internet connectivity and affordability for the purposes of teaching and learning are also identified as key enablers to transform the university education. There is also an emphasis on the use of digital technology to support teacher development by drawing on innovations in the higher education sector and strengthening the link between teacher training colleges and the university's Faculty of Education (Government of Lao PDR, 2021). While the NSEDP clearly articulates its vision for the implementation of technology in education, the Education and Sports Sector Development Plan (2021-2025) is less explicit about its goals for the integration of ICT in education. However, an ICT in Education Strategy is being developed with the support of UNICEF, and the MoES has established an ICT core team to oversee implementation of digital innovation in the sector.

8.1.3. Policies to promote cyber safety and to safeguard student health

Research suggests that digital devices and the internet, tools now used in many education systems, are also a key source of challenges in education systems. Some research suggests that extended use of digital devices is a positive

predictor of both online safety and the development of creativity and innovation (SEAMEO, 2021), and that early access to digital devices allows students to develop their digital skills. However, early access to devices can also be a source of concern for education systems, and challenges can intensify as access to devices broadens.

Globally, problems associated with device use are on the rise. Mobile phone bans continue to be debated and discussed in many high-income contexts where access to devices is widespread (Selwyn & Aagaard, 2021). However, there is emergent evidence that problematic device use is also occurring among adolescents (particularly boys) in low-income settings (Lee et al., 2021). Children, adolescents, and the adults who care for and influence them, are now being exposed to extremist ideologies, misinformation, and conspiracy theories that can stoke discrimination and lead to intense social and political division (Dabrowski & Mitchell, 2022). Increased time unsupervised online also places children at risk of abuse and victimisation (UNICEF, 2022). Girls are also at much greater risk of online exploitation and abuse, particularly in periods of instability and disruption (Onyango et al., 2019). Social media use has also been associated with an increase in a wide range of physical and mental health conditions (Chen et al., 2021; Fazeli et al., 2020), and most recently, phone and gaming addiction have begun to be seen as mental health disorders (Elhai et al., 2021). These issues are a growing source of concern for all education systems. However, most research is focused on high income contexts, despite ongoing interest and investment in educational technology solutions by donors in low-income contexts.

As access to technology increases in Lao PDR, it will be crucial to understand the ways in which Lao PDR incorporates the teaching of skills that can support students to navigate the digital world, as well as to support the education system in responding to the challenges mentioned above. As a result, there has been greater attention by policymakers, teachers and parents in promoting the concept of responsible digital citizenship in children to help prevent and protect them from harmful use of technology. UNESCO (2017) defines digital citizenship as 'being able to find, access, use and create information effectively; engage with other users and with content in an active, critical, sensitive and ethical manner; and navigate the online and ICT environment safely and responsibly, being aware of one's own rights.'

In Lao PDR, a survey conducted by SEAMEO (2021) of children and young people indicate that the country scored the lowest on the Digital Safety and Resilience scale compared to other countries in the Southeast Asia region. This is despite Lao children reporting that they are aware of their safety in an online environment, including the management of personal information for privacy and safety (SEAMEO, 2021). The study also found that Lao PDR children had the lowest mean score in the region for 'understanding child rights' and 'the use of technology for health and well-being'. This suggests that children in Lao PDR are falling behind their peers in the region and more needs to be done to support a greater understanding of how to protect the rights and personal wellbeing children in an online environment.

The Government of Lao PDR recognizes the importance of cyber security and protection of privacy in its efforts to develop a digital economy. The NSEDP (2021-2025) outlines strategies for bringing Lao PDR's telecommunication

security to meet regional and international standards, such as the signing of an international cooperation agreement to install Public Key Infrastructure (PKI), the completion of the Cyber Attack Monitoring System, installation of the Tsubame Sensor packet traffic monitoring system, and improving the information security system of the National Internet Centre to meet ISO27001 compliance[6] (Government of Lao PDR, 2021).

Actions undertaken by the Government include the establishment of the Computer Emergency Response Team (LaoCERT) which has become a member of the Asia-Pacific Computer Emergency Response Team, responsible for monitoring information to prevent cybercrimes and ensure data protection (Mukherji et al., 2022). In addition, legislation has been passed which specifically relates to cyber security and privacy including the Law on Consumer Protection, the Law on Electronic Transactions, Decree on Internet Based Information Control Management, Law on Prevention and Combating Cyber Crime, Electronic Data Protection Act, the Law on Data Protection, and the Law on Prevention and Suppression of Computer Related Crime (Mukheriji et al., 2022). According to a Ministry of Technology and Communication (MTC) official, international private companies have been supporting the Government of Lao PDR to develop its cybersecurity system. For example, the MTC is collaborating with a private company to develop a centralized platform to combat cyber threats by linking all existing government information into one application including regulations and laws, government services, taxes, revenue collection and other registration services.

Despite a concerted effort by the Government of Lao PDR to strengthen governance and regulation of technology and its applications for government and commercial services, this has not been fully realized in the education sector. However, the Government of Lao PDR is working with development partners in developing an ICT in Education Strategy to support the ESSDP (2021-2025) and in alignment with the National Digital Economy Development Plan. There is also growing recognition of the dangers affecting children in the digital environment and according to one MoES official, the Government of Lao PDR has banned the use of mobile devices during class time to reduce student distraction, misinformation and threats to student health and wellbeing. ChildFund in Lao PDR has partnered with the National Commission for the Advancement of Women, Mothers and Children (NCAWMC) to develop a peer education package for youth volunteers in targeted schools to teach adolescents about children's rights and life skills, including digital media safety. The learning tools provide information about the law, practical demonstrations on internet safety and online privacy, activities to help young people assess their own social media addiction and where to seek help (NCAWMC, 2020). The Lao Computer Emergency Response Team has also created a campaign to help educate young people about posting information online, including a video explanation of the Law on Preventing and Combatting Cyber Crime.

Based on stakeholder interviews conducted for this case study, there appears to be opposing views about the benefits of technology use in the classroom and the risks it poses to online safety and wellbeing. There also seems to

[6] ISO27001 is an international standard to manage information security for the establishment, implementation, maintaining and improving an information security management system.

be a disconnect between government policies, actual classroom practice, and the intention of technology interventions around the use of smartphones. As one MoES official noted, 'smartphones are meant to be banned in schools, but some donors don't agree and encourage using smartphones in the classroom and claim that it's for learning'.

There also seems to be agreement between parents, teachers and education stakeholders in Lao PDR about children's increased addiction to gaming and unrestricted access to online content, which is an area which has received little government attention. While the majority of children do not have access to smart devices for learning and the risks of technology use is not yet fully understood in Lao PDR, it is expected that technology will continue to be adopted and expanded to support learning. This provides an opportune time for the Government of Lao PDR to learn from the experiences of other education systems and put in place clear policies and guidelines for the protection children's safety as a precondition for the growth of technology-enabled learning in the classroom.

8.2. Challenges for implementing a strong regulatory framework

Lao PDR's aspirations for a digital transformation of the economy requires a strong policy and regulatory foundation. One of the key challenges facing Lao PDR, is a strong coordination mechanism across multiple sectors and ministries to support the implementation of a more streamlined digital economy and e-government services. The UNDP's Digital Maturity Assessment found that while Lao PDR has adopted a National Digital Economy Vision, Strategy and Plan, line ministries and subnational-level government lack a clear vision for digital transformation (Mukherji et al., 2022).

There is limited evidence of cross-sectoral collaboration between ministries or operational units and this is due to a lack of awareness and understanding of the importance of a connected platform for e-services. Currently, most government ministries have a separate ICT division and 44 percent host their own servers, which creates further siloing of government digital capabilities and infrastructure (Mukherji et al., 2022). However, with the development of a Government Enterprise Architecture and eGovernment Interoperability Framework, there is an opportunity to integrate existing services under a more streamlined ecosystem of digital government initiatives. This will require institutional support at the highest level, including the formation of an oversight intergovernmental committee and additional support for provincial departments to ensure that digital transformation reaches all levels of government and service sectors.

At the school level, teachers have an important role to play translating and applying the government's ICT policies. According to the government's ICT readiness survey, 67 percent of teachers reported that they have implemented standard operating procedures and the rules of conduct of ICT in teaching, which indicates a high level of awareness of ICT policies among teachers (Ministry of Education and Sports, 2021a). However, they also reported limited opportunities to participate in the development of national policies, with only a small number having been consulted in the process (Ministry of Education and Sports, 2021a). The involvement of teachers is critical in the

digital transformation of the education system, as they are key drivers for facilitating technology in learning while at the same time, have the responsibility for safeguarding children's engagement in the digital learning environment.

9. Teachers

Teachers have an important influence on student learning, and teacher quality development policies are essential to any educational reform, including those that seek to enhance and integrate technology. To improve teaching and learning quality in the country, Lao PDR has embarked on a series of education reforms focused on policies expanding access to schools, enhancing teacher quality, and promoting inclusive education. Under the ESSDP 2021-2025, curriculum reform, content knowledge, and pedagogical skills of primary teachers have all been prioritised (Nietschke et al., 2023). However, the education sector of Lao PDR continues to experience challenges in supporting quality teaching and learning.

Poor student learning outcomes are reflected in the low quality of teaching in the country, which has been attributed to a combination of low content knowledge and pedagogical skills of teachers (UNICEF, 2017). Teaching quality varies in Lao PDR, and quality mechanisms that support teacher quality remain emergent. The teaching profession is also subject to many challenges common in low-income settings. Many teachers are poorly remunerated, absenteeism rates are high, and due to low salaries, many teachers are forced to engage in farming in addition to working in their teaching roles, so as to support themselves and their families. Staff at the EMIS Section of the Department of Planning indicated that out of 66,119 active teachers, over 12,000 were 'voluntary', meaning they are government trained and working in government schools, but not being paid state salaries (UNESCO & UNICEF, 2021).

Low teacher quality levels were also exacerbated during the COVID-19 pandemic, as teachers appeared to lack the support and capacity to transition quickly to remote teaching (Nietschke et al., 2023). There is also a scarcity of information on the quality of instruction, and the types of practices that teachers were able to leverage during remote learning in Lao PDR. There is also little research on the ongoing impacts of the pandemic and school related closures on the teaching profession, although some studies suggest that teacher motivation and teacher wellbeing are likely to have been affected (Wong et al., in press).

Teacher shortages were also a problem for Lao PDR even before the pandemic. In 2017, the MoES reported that 12,000 more teachers were required to fulfil national needs (Nietschke et al., 2023). Rural and remote areas of Lao PDR are particularly vulnerable to the challenges associated with high quality teaching staff, as a result of poor resourcing and lack of qualified teachers (UNESCO & UNICEF, 2021).

9.1. Teacher digital skills

In an increasingly connected world, teacher competency in using online and digital pedagogies is crucial to support the development of student skills. However, as research undertaken into remote learning practices during the

pandemic has demonstrated, teacher competency in the use of ICT remains low in many countries. Different levels of digital literacy amongst teachers also acts as a major barrier to the effective integration and use of technology in many countries, including in Lao PDR.

Research has highlighted the disparate skills of teachers and the need for additional training in the use of educational technology. Data from OECD's Teaching and Learning International Survey (TALIS) provides numerous examples from many countries that teachers' understanding of integrating technology into teaching and learning practice is limited, highlighting the need for timely training for staff on remote learning, and opportunities for knowledge sharing, and its mobilization amongst teachers (OECD, 2020 as cited in Dabrowski et al., 2022). Recommendations to support teacher training and development include access to tools, online professional development modules, and coaching or mentoring to build capacity at scale. TALIS also demonstrated that only 60 percent of teachers have received professional development in the use of ICT, while close to 20 percent of teachers reported a high need for development in this area. Similar findings have also been highlighted in Lao PDR, where teachers continue to struggle to develop competence in the use of educational technology.

The education system of Lao PDR still offers a traditional approach to pedagogy and its delivery methods. Prior to COVID-19, digitalization and digital skills played a minor role in all levels of education, but the pandemic has led to increased reliance on technology and devices in the education sector. Unfortunately, many teachers in Lao PDR still lack adequate ICT skills to enable them to use technology to facilitate teaching and learning in the classroom.

A 2021 survey on ICT demonstrated that while teachers generally agree that ICT plays an important role in education, teacher competency in ICT is low in both urban and rural areas (Ministry of Education and Sports, 2021a). Secondary school teachers have more ICT skills compared to kindergarten and primary school teachers, and new teachers or junior teachers are more likely to have ICT skills than older teachers or teachers with more years of teaching experience (Ministry of Education and Sports, 2021a). These concerns were also reported by several government stakeholders in Lao PDR:

> **They use smartphones and computers but not in a way that benefited their work and learning.**

> **Many primary school teachers don't have teacher training qualification. These teachers are old and don't know how to use technology.**

In practice, most teachers are not encouraged to use ICT in teaching, and digital skills (including the use for both general work and teaching) of teachers were found to be low in all areas, including in the capital. Due to low level skills, there were concerns around the skills of teachers not matching the ambitious aims of current education reforms in Lao PDR, as one government stakeholder noted.

Content in the ICT subject teaching upper secondary school level is too ambitious. It aims to teach Year 5 students to 'install and repair computer hardware'. It's not appropriate for the existing level of knowledge of both teachers and students. The Teacher Training College doesn't prepare their pre-service trainee to teach the content in the curriculum.

9.1.1. Standards-based reform

Although the National Teaching Standards, developed in 2017, have not yet been fully implemented in Lao PDR, there have been efforts to improve teacher quality and competence in the area of educational technology. As part of the review of the Teacher Education Curriculum, the first Information and Communications Technologies Competency Standards for Teachers (ICT-CST) were launched in April 2022 (Ministry of Education and Sports, 2022). Endorsed in January 2022, the ICT-CST offer a foundation for promoting competency-based teacher ICT training programmes in Lao PDR with 11 standards and 47 performance indicators under six domains:

- Understanding ICT Policy in Education
- Curriculum and Assessment
- Pedagogy
- Application of Digital Skills
- Organization and Administration
- Teacher Professional Learning.

Low levels of teacher digital literacy and preparedness to incorporate technology as part of their practice threaten to jeopardise the success of programmes designed to enhance student digital literacy and use of technology. It is also difficult to determine the current quality of digital pedagogies in Lao PDR, and how digital skills are embedded as part of curricula delivery, reflected in learning materials, and assessed. In time, it is likely that there will be more information on ways that teachers are supporting the development of digital skills in primary and secondary education. There is also little evidence on ways that teachers use technology to communicate with families. Family support and engagement can enhance student readiness to engage in technology, it can also support the ongoing development of digital skills for students, but also promote communication and engagement between families and educators. Technology applications can help teachers maintain student motivation and concentration and bring them to order; receive scripted support; communicate with parents; and carry out multiple routine tasks, such as how to present information, summarize discussions, take notes, and annotate texts (UNESCO, 2022).

The use of technology can offer new pathways for teaching and learning, and may also support inclusion and equity. However, developing teacher competence and capacity to use technology remains difficult in Lao PDR for many reasons, such as reduced access to professional learning or pre-service training in ICT, limited opportunities to practice using technology in the classroom, and inequitable access to devices and data.

9.2. Technology and teacher training

Based on a survey conducted by the MoES in 2021, many teachers in Lao PDR do not recognize the importance of training and development in enhancing their skills in using technology, where more than 50 percent of teachers in Lao PDR did not see the value of participating in professional development focused on the use of ICT in Lao PDR. A recent survey by UNESCO on ICT readiness (2022) of the Lao PDR education system also found that 78 percent of in-service and pre-service teachers had never received ICT training, reflecting the findings of the MoES survey, which reported that 78 percent of staff did not receive ICT training at either system or school level (Ministry of Education and Sports, 2021a). Teachers who receive CPD largely report effectiveness of the various modalities provided to them (BEQUAL, in press). Face-to-face training was accessed the most by teachers surveyed by BEQUAL, however, one-to-one advice, co-teaching and school clusters were more highly valued. While online learning was rated as helpful to very helpful, it was the least accessed by teachers with 75 percent reported participating once a year (BEQUAL, in press).

9.2.1. Pre-service teacher training

One of the main strategies of the ESSDP 2016-2020, was to provide pre-service and in-service training to vocational education teachers and staff. However, it did not identify areas of specific focus or mention of providing pre-service or in-service training to teachers and staff working in schools (UNESCO, 2023). Recommendations around the need for Teacher Development Centre and TTCs to better support educator practice and improve the quality of teaching and learning were similarly ambiguous.

ICT is now offered as part of the teacher pre-service training program through the TTCs, which covers basic skills such as email and the Microsoft suite. In addition, three new competency-based ICT course syllabi are planned for implementation in the coming years. These will form part of pre-service teacher programmes for early childhood, primary, and secondary education (MoES, 2022) as part of the ICT competency standards. There are three proficiency levels for teachers:

1. Understand the goals and policies related to ICT use; create simple teaching and learning materials using ICT; learn basic ICT skills by participating in various training
2. Have good knowledge and application of ICT tools to support student learning performance; apply policies and regulations to ICT use; use ICT tools to design activities to support student-centered learning; apply assessment strategies
3. Plan and apply advanced ICT tools to prepare lesson plans and activities to increase teaching efficiency; use ICT tools to support learners skill development in critical thinking, analysis, creativity and teamwork; create own learning plans and goals; share effective teaching practices and assessment methods with other teachers.

While ICT is included as a subject at the upper secondary level, one teacher educator reported that only ten percent of students who enrol in the ICT pre-service training course have basic computer skills. Despite the demand for digital skills training, the TTCs are ill-equipped with limited smart devices and computers to aid student learning.

Teacher trainers often have to rely on developing their own online content and using open-source software such as YouTube and Kahoot to enhance students' learning experiences. One lecturer noted that:

> **Textbooks and teacher guides don't provide enough resources for me and my students to be able to be active teachers when they graduate from the TTC. Information/lesson found online is more updated and more useful for teacher trainees than printed materials**

9.2.2. Continuous professional development of teachers

At the onset of the pandemic, guidelines were developed to build teacher capacity in using technology to support learning continuity. Policies to support remote learning and the establishment of the centralized online learning platform Khang Panya Lao offered teachers resources to help plan and deliver lessons to suit their local context. Khang Panya Lao allows teachers with experience of using traditional platforms of teaching such as pen, paper, or blackboard the opportunity to access a digital interface using smart mobile phones, tablets, and online websites. Teachers are also able to access resources that support lessons such as interactive games, story books, and instruction videos (Nietschke et al., 2023).

Bilateral partners, such as the Australian Government, through the BEQUAL Program, scaled up support for teacher training in digital and online learning during the pandemic and have continued to deliver CPD for teachers including the development of pedagogical skills and teacher training materials. Since the onset of the COVID-19 pandemic, BEQUAL has also been piloting several alternative training modalities and approaches to ensure the continuation of training and support for teacher trainers. The Blended Learning Pilot, which was a combination of face-to-face and online learning, was trialled in three provinces and has since been expanded to all provincial and master trainers across the country. The purpose of the training was to introduce a flexible mode to support teacher professional learning during and post COVID-19. The workshops provided trainers with the opportunity to practice ICT skills and deliver the workshops using a blended approach. Feedback has been positive, as one Department of Teacher Education representative noted:

> **The blended learning approach offered the learner convenience and flexibility; they can control their learning pace and learn remotely. It is also very relevant for remote areas, reducing traveling time and costs to training locations that may be difficult to reach. It allowed the Master Trainers to respond timely to difficulties encountered by Provincial Trainers and to provide continuous guidance via remote support sessions. But there are still many challenges with having access to online tools such as computers and internet as well as developing the technical skills to use online tools.**

A recent survey of Provincial and Master trainers, principals and teachers also found that teachers successfully accessed a range of CPD modalities including cluster and school-based training activities (BEQUAL, in press).

However, digital formats were more likely to be accessed by DESB, PESS and TTC staff than teachers and principals, which may suggest that technology use is still a barrier at the school level.

Teacher knowledge and involvement in the development of ICT policies and practices are also important predictors of effective technology use. Most teachers in Lao PDR seem to be aware of ICT policies at the school level, but there appears to be little opportunity for teachers to participate in the development of national ICT policies and laws (Ministry of Education and Sports, 2021c). As the successful integration of teaching and learning requires greater reflection on the role of teachers, leveraging teacher voice and autonomy could support Lao PDR to achieve its objectives for education reform and enhance use of technology in the future.

9.3. Discussion: Main issues on the use of education technology in the country

The aim of this Case Study is to explore progress in Lao PDR's implementation of technology in education, and to identify the preconditions that support transformation of a digitalized education system. Based on a comprehensive review of literature and interviews with stakeholders, Lao PDR is at a critical juncture in realizing its vision for a digital future. The COVID-19 pandemic provided a unique opportunity to reflect on the challenges and best practices that were adopted to support children's learning during periods of school disruption. There were also valuable lessons that highlighted certain bottlenecks in the system which can provide new impetus for education policymakers, practitioners, and development partners in Lao PDR to review current technology initiatives. Accordingly, there now needs to be a clear understanding of the purpose for ICT adoption and the role it plays in improving teaching and learning, including measures to track progress against the educational goals of the country.

9.4. Opportunities for digital transformation of education

Lao PDR is still at a nascent stage in its progress towards digitalization of the education sector. However, there is evidence of some existing preconditions that support broader efforts to transform the economy and government services through ICT adoption. In turn, these could also benefit the education sector. For example, response to the COVID-19 pandemic has revealed a high level of coordination from education stakeholders including line ministries, subnational government divisions, development partners and the private sector. These actions provided an opportunity for greater efficiency in responding to the pandemic through targeted funding for vulnerable students, a focus on teacher development and the establishment of the Khang Panya Lao online platform to support online and blended learning approaches.

In recent years, the Government of Lao PDR has embarked on a series of broader initiatives to accelerate ICT development in the country. There is evidence of a strong political commitment at the highest level to transform Lao PDR into thriving economy, based on a digitally skilled workforce and a robust policy and regulatory environment that promotes e-commerce and expansion into regional markets. To this end, the Government of Lao PDR has introduced ICT legislation and policies in line with international standards and has become signatories to regional and international bodies governing ICT practices. Bilateral donors, development partners, and the private sector have also played a significant role in supporting the development of digital infrastructure in Lao PDR. This includes

the laying of an extensive fibre optic network across the country offering the potential for mobile and internet access to the majority of the population. These investments, together with high-level government commitments to technology integration, presents a strong policy enabling environment for the digitalization of the education sector.

Evidence from this Case Study also points to a higher education sector that is more open to technological change, with greater investment by donors and the government over the last decade, increased confidence from teaching staff to adopt technology tools and processes, and students who are motivated to use technology to facilitate their own learning. Similar to other countries in the Southeast Asia region, Lao PDR tertiary institutions and teacher training colleges have been early adopters of technology in teaching and learning. These institutions are more likely to be equipped with digital devices and tools to facilitate learning, as well as teaching staff who demonstrate higher-level digital literacy and ICT skills. The private sector and some bilateral donors have also focused their attention on the higher education sector with investments in infrastructure and skills development and training for teachers. This provides an opportunity to leverage technology use and digital skills of tertiary providers through stronger collaboration with the school sector. Interviews with district and provincial staff show a willingness to adopt technology innovations in teaching and learning, and further investments by MoES and development partners should be targeted at teacher training through DESB and PESS trainers. This would require appropriate resourcing for continuous professional development of teachers and school leaders through funding for their travel and participation in cascade training at district or provincial offices or at the cluster school level.

Investments in national ICT infrastructure networks have resulted in greater mobile connectivity across Lao PDR. Greater accessibility to internet and mobile services has also driven growth in smartphone usage, with over 90 percent of households owning a mobile phone. While smartphones are accessible to most of the population, its potential for supporting learning was not fully realized during the COVID-19 pandemic. This suggests an opportunity to leverage mobile technology more fully to supplement classroom-based learning. Even in rural and remote areas where access to internet services and a stable electricity supply may be limited, experience from other countries indicate that smartphones can be used to connect to the internet via radio waves (2G-4G) and without a connection through stored data (e.g., via pre-loaded content) or offline function (e.g., via USB or flash drives).

In addition, the use of small and low-maintenance solar panels to power digital devices is also becoming more prominent in low-income countries and offers a cost-effective option for school communities in rural and remote areas. It is estimated that a small solar panel with a battery, which costs around USD 13-16, can provide enough power for about three to four lights in a house and would be enough to charge a mobile device (JICA, in press).

9.5. Current challenges in the digital transformation of education

The successful integration of technology in the education system must be specific to the context of the country and purposely directed at improving access, quality and equity in education. This will be guided by a country's level of access to connectivity, provision of equipment and the digital capability of its teachers and students. In Lao PDR, despite recent progress in the digitalization of the economy and some government e-services, the vision for digital

transformation of the education sector remains aspirational. Findings from this Case Study indicate that there is a lack of system readiness to adopt technology for learning and there is a need to incorporate digital capabilities into the curriculum and the technical and vocational education sectors to better prepare students for a more competitive workforce.

The Education and Sport Sector Development Plan (2021-2025) remains ambitious and there appears to be an assumption of readiness across different contexts at the school, sector and systems levels for the implementation of technology. The ESSDP lacks a clear strategy for the education sector, particularly for digital literacy and its impact on equity and quality of learning outcomes for primary and secondary students. Successful use of technology requires both teachers and students to have access to appropriate resources and well-designed learning environments. It is critical that teachers are provided with appropriate support and professional learning, particularly in the application of technology that makes use of effective digital pedagogies.

There is a lack of evidence from this Case Study of the integration of digital skills in curricula, assessment or teacher training programmes. There are also significant gaps in understanding how students are developing skills that support their use of technology to improve learning, particularly for those already disadvantaged by gender, poverty, ethnicity or disability. These accessibility challenges are magnified by a lack of literacy and digital skills. For Lao PDR, traditional pedagogical approaches are still most relevant for many students and the use of technology provides a tool to supplement, rather than replace, teaching. In the most disadvantaged communities that have limited access to digital technology interventions, face-to-face learning remains the best option.

The lack of teacher capabilities to teach digital skills is a key inhibiting factor for transforming the education sector. Low digital literacy is often attributed to a lack of integration of ICT within teacher education programmes as well as in-service professional development. Teachers need training in how to use technology to support students, regardless of access to materials or irrespective of distance. With the right support, teachers can encourage their students to become active participants in the learning process and contribute to the construction of knowledge (Wikramanayake, 2005; Khan et al., 2012) that empowers students and builds their capacity.

While the introduction of the ICT Teacher Competency Standards in Lao PDR is an important marker of progress, it remains in early stages of implementation. There is also low-level readiness at the district and provincial levels to support teacher development and training, with poor digital infrastructure and resourcing. At the school level, there is a lack of digital devices to support learning, and where devices are available, there seems to be a lack of willingness and low motivation from teachers to adopt technology in their teaching practice. This may stem from low digital literacy skills and a poor understanding of digital pedagogy, but it may also be because of low motivation due to workload, burnout, or low levels of remuneration; issues attributed as barriers to engagement and retention by teaching professions in many other countries. These issues are worth exploring, as most teachers own a smartphone and regularly use platforms such as WhatsApp and Facebook for communication, it should be assumed they have some level of confidence with technology use. With targeted training, dedicated resourcing, and

opportunities for peer mentoring of less confident teachers, there could be opportunities to influence teachers' behaviour and confidence in adapting technology tools in classroom practice.

Given the rapid development of digital infrastructure and ongoing issues impacting equity of access to technology and learning outcomes, further research considering both the benefits and risks of integrating technology into the education system of Lao PDR should be undertaken. The findings from this Case Study highlight the challenges associated with digital adoption in learning as well as the opportunities to leverage the ongoing digitalization of the Lao PDR economy and public sector services to support technology integration in the education sector at the school, sector and systems levels.

10. Conclusion

The integration of digital technologies into teaching and learning practices has evolved rapidly, leading to tools and applications that facilitate new ways for the sharing of knowledge and supporting student-teacher interactions in the classroom. These innovations have demonstrated the potential for transforming learning by introducing new pedagogical approaches and flexible delivery that can improve access and quality of educational outcomes for all students. The adoption of digital technologies in the delivery of education services can also enhance decision-making at the policy level to support quality and relevance through improved education administration and governance.

Lao PDR has made significant progress in the development of its digital infrastructure and strengthening the regulatory environment in recent years to support future economic growth and human capital development. These conditions provide the opportunity to further embed technology innovations into the education sector, by focusing support on key system and school-level enablers. While the adoption of technology in education is still emergent, there is an opportunity for the Government of Lao PDR and its partners to better prepare the sector for future digitalization.

At the institutional level, this means strengthening education planning and management systems at both the central, provincial and district offices with sustained resourcing for teacher training, monitoring and data management. There is also an opportunity to consolidate the curriculum reform process by incorporating digital literacy and innovative pedagogies into the curriculum to better prepare students for a digitalized workforce. This will require a strong coordination mechanism across all relevant line ministries and development partners, to reduce the potential for fragmentation and dilution of effort and resources. At the school level, adequate financing and training for a skilled teaching workforce is required, by ensuring that teachers are sufficiently remunerated and supported to prevent burnout and poor performance.

Effective integration of technology in education has the potential to address some of the persistent challenges in the education sector in Lao PDR. However, through a clear strategy for the implementation of technology that considers

current challenges and strengths in the system, Lao PDR has the opportunity to carefully prepare the education system for the effective adoption of technology that is directly aligned with its education goals.

11. Recommendations

Based on the findings of this Case Study, the following recommendations are proposed for the digital transformation of the education sector in Lao PDR, taking into account preconditions for supporting technology reforms at the system, sector and school levels. The recommendations are relevant for Lao PDR, but also for comparable contexts seeking to enhance the use of technology within the education sector, while supporting educators and schools with different levels of access, resourcing, and readiness.

Target level	**Recommendations**
System capability *(e.g., policies, institutional support structures, digital infrastructure and capacity at the central and sub-national levels)*	• Establish an intergovernmental committee at the highest level, which is responsible for the oversight and coordination of investments and implementation of technology in education. • Incorporate clear objectives and strategies for the development of digital skills for the school, TVET and higher education sectors in national education policies and plans. • Develop digital capacity across the MoES, including providing incentives to attract and retain skilled staff, and invest in resourcing for equipment and maintenance of digital infrastructure. • Invest in ongoing monitoring and evaluation of technological initiatives to build data usage capacity across the MoES. • Prioritize policies and strategies to support digital access for disadvantaged and at-risk students, including the development of inclusive education content and specialized support.
Sector capability *(e.g., curriculum, teacher training and assessments, centralized monitoring systems for planning and management, teacher training)*	• Incorporate digital skills and blended and digital pedagogy into curricula, teacher training, and student assessments. • Enhance system and school interaction by providing adequate resourcing and support for district and provincial school planning and management. • Establish and expand the adoption of a centralized system for monitoring education access, quality and equity (including capacity building for the integration of LESMIS for decision-making). • Invest in building the competence in ICT and digital skills of teachers through policy guidance and resourcing at multiple levels of government and across different sectors. • Invest in technology tools that can facilitate differentiated learning for all students.
School capability *(e.g., digital literacy of teachers and students, teacher motivation and*	• Incorporate digital literacy skills in curricula, textbooks, and assessments. • Broaden digital literacy skills to foster critical and creative thinking as part of classroom practice. • Promote digital literacy of teachers by providing dedicated support for teacher training through cluster training and mentoring approaches.

confidence, digital tools for flexible delivery)	• Adopt the innovative use of technology tools for teaching and learning, by leveraging widespread use of mobile phones. • Build awareness and capacity of teachers and school leaders to implement policies to protect student safety and wellbeing for online learning. • Ensure adequate resourcing in digital interventions that prioritize disadvantaged students, including access to digital tools and encouraging community support for the provision of resources to support learning. • Invest in digital infrastructure to facilitate connectivity and access for all schools, prioritizing rural and remote areas.

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Appendices

Appendix 1: List of Organizations Interviewed

Australian Department of Foreign Affairs and Trade in Lao PDR

Basic Education Quality and Access in Lao PDR

Department of Legislation and Education Quality Assurance

District Education and Sports Bureau

EU Delegation to Lao PDR

Japan International Cooperation Agency

Lao Telecom Company

Ministry of Technology and Communications

National University of Laos

Ministry of Education and Sports

Provincial Education and Sports Services

Research Institute of Educational Sciences

Souphanouvong University

Soutsaka Institute of Technology

Teacher Training College

UNICEF Lao PDR

USAID Lao PDR

Appendix 2: Interview protocols

Format

The interview with key informants will last approximately 30 minutes. The interview will be conducted face-to-face or via video conferencing software. If a live interview is not possible, the interview questions will be administered over the phone. The interviews will follow a semi-structured protocol, with key questions asked of all informants and scope to explore ideas/examples in more detail as they emerge.

Interviews will be recorded to facilitate note-taking and later analysis. Data will be stored securely on the ACER cloud platform and destroyed 30 days after the project end date. All personal information will be de-identified in reporting.

Purpose of interview

This interview seeks to explore the current and ongoing initiatives supporting the use of technology in education in Lao PDR. It also examines the challenges and pre-conditions in which appropriate use of technology can offer solutions and support for improvements in the education system. The interviews aim to capture the perspective of different stakeholders, providing a point of comparison among government, development partners, implementing agencies and the private sector. These insights will be used to further clarify and understand the gaps identified in the literature review.

The key informant interviews will consist of the following key questions:

1. What technology initiatives are being implemented by your organisation to support [education and technology in Lao PDR]?
    a. [For stakeholders involved in Kang Panya Laos] What is your department/organisation's involvement with the KPL platform?
    b. What priority/need does this initiative respond to?
    c. Who are the target groups or beneficiaries of this initiative? (e.g., teachers, parents, students)
2. What do you think are the key challenges in the education sector [OR in Lao PDR] and how could technology offer a solution? (e.g., mobile coverage vs. fixed broadband coverage, access to devices, digital skills, privacy of data, security)
3. What do you see are the key opportunities to support improved educational outcomes through the use of technology? OR What do you think needs to happen for technology to move forward in any way?
    a. What is working well at the policy level?
    b. What is working well at the classroom level?
4. Are there any recent studies or surveys that have been conducted by your organisation on technology that you could share with us?

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