5 Funding and procurement for digital education

This chapter highlights current challenges related to the funding and procurement of digital education technologies. Policy makers in many countries have limited information available when making investment decisions, and the funding environment for digital education technologies is fragmented, creating planning and budgeting difficulties for education institutions. The chapter presents a number of promising approaches that countries have used to address these challenges by adapting funding and revenue models to the specificities of digital education and by building collective capacity across education institutions to make smarter investments in digital technologies.

Introduction

Digital education entails large investments in the physical and human infrastructure of education institutions. This chapter focuses on how funding and procurement mechanisms must be rethought to enable efficient and equitable investments for digital education. As such, this chapter lays the foundation for infrastructure, capacity building and human resource policies described in subsequent chapters.

In general, smart education investments require a fundamental understanding of the flow of resources and the effects specific investments yield on education outcomes. With respect to digital education, large knowledge gaps persist on the extent of investments in digital technologies within education systems, although there is some evidence suggesting that public spending levels are currently insufficient to cover institutions' funding needs. There are also mixed research findings regarding the cost-efficiency of investments in digital education, calling for well-considered and evidence-based spending on digital education. Raising the necessary information to guarantee sufficient and efficient investments in digital education might entail adapting institutional budgeting and accounting practices as well as promoting better evaluation of digital education policies.

Further, Institutional funding frameworks need to provide education institutions with the resources they need for the acquisition and deployment of digital education technologies, in line with policy objectives. To do so effectively, institutional funding models may need to evolve and adapt to the particularities of digital education technologies. This could include, for example, permitting the inclusion of new modes of education participation (e.g. enrolment in online or hybrid education programmes) for core institutional funding and student aid. Funding allocation mechanisms may also need to be adapted to the specific nature of investments in digital technologies, which often comprise a mix of upfront capital investments and recurrent expenditure. Funding frameworks should further seek to address potential equity issues in access to digital education technologies and take into account existing governance and decision-making arrangements related to digitalisation within different education sectors.

Finally, effective procurement for digital education requires a forward-looking approach and a deep understanding of the complex EdTech sector. Individual education institutions often lack the necessary expertise or bargaining power to make efficient investments in digital education. Depending on education institutions' role in the procurement process, governments may need to provide guidance and tools to support institutions' procurement decisions or ensure that efficient central procurement mechanisms are in place.

The funding and procurement of digital education technologies raises a number of questions for policy makers, which this chapter seeks to address by taking stock of the available evidence and presenting promising approaches observed in OECD and EU countries:

- How much do school and higher education systems invest in digital education technologies and is current investment sufficient to cover education institutions' needs?
- How can education systems promote efficiency in spending on digital education?
- Are institutional funding framework adapted to new modes of teaching and learning enabled by digital education technologies?
- Are education institutions enabled and incentivised to invest in digital technologies in line with their students' needs as well as system-wide goals?

Recent developments and current challenges

Comparative data on digital education investments and evidence of their efficiency remain limited

Institutional accounting and budgeting practices do not permit the identification of public expenditure on digital education…

The joint UNESCO-OECD-Eurostat data collection, published annually in *Education at a Glance*, provides a wealth of internationally comparable data and indicators on education investments across countries and levels of education. These data show that across all education levels, education funding is mostly spent on current expenditure[1] (more than 90% on average across OECD and EU countries with available data), with the remainder being devoted to capital expenditure[2] (OECD, 2021[1]):

- In school education, across the OECD in 2018, the largest share of current expenditure in public and government-dependent private primary, secondary and post-secondary non-tertiary institutions was devoted to compensation of teaching and non-teaching staff (77%), with the remaining 23% dedicated to other operational expenditure (utilities and other service providers, supplies, day-to-day maintenance and equipment costs) (OECD, 2021[1]).[3]
- In higher education, in 2018, public and government-dependent higher education institutions in OECD countries with available data dedicated roughly one-third of their total spending to compensation of staff with a direct teaching role (i.e. most academic staff), one-quarter to compensation for support, professional and research staff, a further third to other operational expenditure (e.g. utilities, supplies, day-to-day maintenance and equipment costs) and around 10% to capital investment (major investments in infrastructure and equipment) (OECD, 2021[1]).

Evidence about expenditure devoted specifically to digital education is scarce. An OECD Digital Economy Policy Questionnaire administered in 2016 reveals that among the 38 OECD and partner countries surveyed, around 75% of governments reported allocating funds to ICT literacy objectives in state/national curricula and more than 70% reported buying ICT goods and services for students. The most frequent types of public expenditure on ICT in education were financial support for ICT equipment or Internet connections for public schools: around 50% of surveyed countries reported expenditure on these expenses. Policies for buying or developing digital learning materials (e.g. e-textbooks) were less common (reported by 25% of surveyed countries) (OECD, 2017[2]).

Apart from ad-hoc and one-off data collections, no consolidated internationally comparative data exist to provide an overview of expenditure on digital technologies by education institutions at various levels of education, or by governments. A 2019 survey of European countries revealed the difficulty of identifying the actual government funds invested in digital infrastructure for school education (European Commission/EACEA/Eurydice, 2019[3]) (European Commission/EACEA/Eurydice, 2019[3]).

Part of the difficulty lies in the fact that accounting and financial reporting systems are not designed to identify different types of expenditure that support digital learning. As expenditure related to digital education often comprises a mix of capital spending and current expenditure (e.g. software product purchases, staff costs and technology-related services), it tends to be grouped with other expenditure of a similar type that is unrelated to digital education. In this context, it is not possible to rely on government budget's line items to track digitalisation spending.

Likewise, the budgets of education institutions usually do not categorise their spending on digital infrastructure separately within their accounting systems. For instance, the UNESCO-OECD-EUROSTAT (UOE) data collection on expenditure in education institutions, which is reported annually in Education at a Glance, covers expenditure on digitalisation, but most spending on digitalisation is integrated into capital expenditure or the category of "expenditure on other resources", which includes the purchase of teaching

and learning materials, other materials and supplies, equipment items not classified as capital, fuel, electricity, telecommunications, travel expenses, and insurance. The level of granularity in reporting is thus insufficient to identify expenditure related specifically to digital infrastructure.

Special efforts have been made to create spending estimates in some countries:

- For example, in **Ireland** a review of technical higher education infrastructure detailed the difficulty of arriving at an estimate of expenditure on IT within the current accounting practices, concluding that expenditure on IT in the region amounted to 4% of the non-pay budget (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2017[4]).
- Data from the **United States** (Educause, 2022[5]) indicate that median spending per full-time equivalent student on central IT services in public and private higher education institutions was around USD 1 300 in 2020/21. However, these figures only capture part of total spending on digital learning, as they exclude expenditure on staff time, at department and faculty level.

Whilst data on public spending on digital education are hard to obtain, estimates from the private sector can give some idea of digital education spending. Market estimates indicate that while global expenditure by governments, employers and consumers on hardware, software and technology-enabled services has intensified, it continues to represent only a small share (4%) of global spending on education and training (HolonIQ, 2020[6]; HolonIQ, 2021[7]). Other estimates from market research companies in the **United States** provide an indication of the amounts spent by education institutions on digital technologies in some countries. There, the share of expenditure in central IT departments of HEIs was estimated to be 4.2% in 2021, with a median expenditure of USD 7.7 million (USD 1 316 per student) (Educause, 2022[8]). With respect to school education, the median public district among the 77 largest urban public school systems in the United States spent around 2% of its budget on network services, computers and devices, technical support, systems and software (Council of the Great City Schools, 2020[9]).

… but expenditure levels on digital education are likely insufficient

There is limited evidence on the funding needs of schools and higher education institutions on digital education, although TALIS data suggest that a significant proportion of schools are struggling with a lack of resources for digital education. Prior to the pandemic, in 2018, 25% of lower secondary principals in OECD countries reported that shortages or inadequacy of digital technology for instruction were hindering their schools' capacity to provide quality instruction "quite a bit" or "a lot" (OECD, 2019[10]). This was confirmed by lower secondary teachers, 35% of whom reported that investing in ICT was a spending priority "of high importance" across OECD countries (34% across participating EU countries). The situation varied across countries though. Overall, ICT investment was perceived as a high priority by more than half of lower secondary teachers in Israel, Hungary, Mexico and Colombia, but by one out of five or less in Finland, Denmark, Sweden and Slovenia (OECD, 2019, p. 207[10]).

Various studies in Europe have also identified a need for additional investment to support the expansion of digital learning in higher education (EUA, 2021[11]), but there have been few attempts to quantify the investment requirements. One example of an effort to quantify investment needs comes from **Germany**. A 2019 report by Germany's national Commission of Experts for Research and Innovation argued that the "digitalisation of Germany's structurally underfinanced higher education system is an ongoing task which requires long-term financing" and proposed the introduction of a specific public funding allocation per student to develop and maintain digital infrastructure and expand digital teaching and learning offerings (EFI, 2019[12]). In 2021, the German Rectors' Conference adopted this proposal in a funding request to the federal and state governments, calculating, bottom-up, an annual funding requirement of EUR 92 per student (EUR 270 million in total), of which 40% would be dedicated to the development of digital learning offerings (including adapted learning spaces and new online courses, such as micro-credentials), 30% to services to support digital learning and 30% to purchasing and maintaining related infrastructure (HRK, 2021[13]). However, in general, there have been few studies of the cost of digital higher education provision

(and whether it leads to cost savings elsewhere) which could be used as a basis to quantify investment requirements (OECD, forthcoming).

Available evidence suggests that not all investments in digital education are cost-efficient

The lack of information on expenditures on digital education technologies means that assessing efficiency of investments is challenging. Existing research indicates that the cost saving potential of digitally enhanced education may be limited, at least in the short term. For instance, recent experimental research demonstrates that education software has higher fixed and maintenance costs than conventional teaching tools, while the marginal costs are at a similar level (Ma et al., 2020[14]). The cost differential between technology and traditional tools calls for evidence on the effects of digital technologies on education outcomes to ensure efficient investments. Further analyses on the costs and benefits of digital education, would allow for better-informed investment in and allocation of digital technologies in education systems. Evidence from the experimental and quasi-experimental evaluation literature suggests that programmes investing in digital education equipment and connectivity have been successful in expanding access to computers, and also resulted in higher levels of computer use and skills (Escueta et al., 2017[15]). These patterns hold across a range of policy intervention types (e.g. subsidies for low-income families to acquire computers, one-to-one-laptop or tablet programmes, and subsidies for school computers). However, simply expanding access to digital resources (e.g. computer hardware or Internet access) is insufficient to enhance students' *academic performance*. Substantial research evidence shows that increases in digital infrastructure investments in the form of computers, laptops, tablets or Internet access for schoolchildren display little or no positive effects on students' education outcomes (Bulman and Fairlie, 2016[16]; Escueta et al., 2017[15]).

Research on the impact of education software use on student outcomes suggests that multi-dimensional policies – including the expansion of access to digital equipment and connectivity, the introduction of specific learning tools or interventions, and policies addressing the wider learning ecosystem (e.g. guidelines or support for parents, building teachers' digital pedagogy skills) – are most effective. Evidence from the COVID-19 pandemic has shown that even where gaps in access to equipment were bridged and students from socio-economically disadvantaged schools received the necessary equipment to engage in remote learning, inequalities in how students *use* these tools and the level of their engagement with the equipment persisted (NESTA, 2021[17]). Thus, policies that target divides in access to digital equipment should go hand in hand with building the capacity of users and the broader learning ecosystem. Chapter 7 on building capacity for digital education analyses these aspects in more depth.

In higher education, available evidence suggests that developing and delivering online programmes is not systematically less costly than developing and delivering on-campus programmes. Some studies find evidence of cost-efficiency potential. For example, an evaluation of the effects of hybrid teaching in engineering programmes in Russia undertaken by Chirikov et al. (2020[18]), have found that students in online courses achieve similar learning outcomes to those receiving traditional in-person instruction at substantially lower costs. Bowen et. al. (2013[19]) likewise implemented a randomised trial in which a statistics course was taught in-person and in a hybrid mode, with the use of cognitive tutors and feedback loops to guide hybrid learners through instruction in basic concepts. Learners in the hybrid course achieved learning outcomes equivalent to those receiving in-person instruction, and simulations carried out by the researchers indicated that since outcomes were not worse, the course may be delivered on line at lower cost (Bowen et al., 2013[19]). By contrast, Hemelt et al. (2018[20]) find, using programme-level data on US higher education programmes, only moderate cost reductions associated with online undergraduate programmes (and none for post-graduate programmes). Wolff, Baumol and Saini (2014[21]) and Xu and Xu (2019[22]) argue that online education has the potential for cost saving and added value for particular target groups, but note the challenges of achieving cost reductions within the constraints of current higher education staffing and governance models.

The question of the potential cost savings that can be achieved through adopting digital learning routinely emerges in policy discussions. In the **Netherlands**, for example, a recent government policy paper argued that increased deployment of digital technologies in learning in higher education would allow efficiency gains, as well as quality improvements (Government of the Netherlands, 2021[23]). In response, commentators from the academic community have argued that using digital technology in learning and teaching typically requires more time – and thus higher costs – than traditional forms of classroom learning. The same commentators argue that digital learning technologies might enrich and support teaching but cannot replace or automate specific teaching-related tasks (van Baalen et al., 2021[24]).

However, the limited evidence base concerning the cost-efficiency of education investments is not a problem specific to digital education (OECD, 2022[25]). The use of cost-benefit and cost-effectiveness analyses in education is traditionally underdeveloped compared to other sectors (e.g. health). Previous research on this topic has highlighted a range of conceptual and measurement issues (e.g. related to the recording of costs in education systems) that make it difficult to generate cost-efficiency evidence and use it for policy making in the education sector (Hummel-Rossi and Ashdown, 2002[26]). However, although countries struggle to track investments in digital education, digital technologies also provide new opportunities to measure the effects of policy interventions in education: Digital education technologies can generate rich data that can – if employed effectively – provide valuable sources of evidence to assess the effects of using digital technologies and other classroom practices on student outcomes (OECD, 2013[27]).

Revenue-raising arrangements can generate inequities in the access to quality digital education technology

In OECD countries, schools and their digital education technologies are predominantly funded from public sources (90% in 2018), although the share of private funding is higher at the upper secondary education level (14%) (OECD, 2021[1]). Education systems across the OECD display a complex distribution of responsibilities for allocating funding across education sectors (OECD, 2017[28]). Most systems rely on a mix of central and sub-central funding for schools, with central government funding depending mostly on taxes while sub-central revenues are a typically a mix of taxes (own taxes and taxes shared with other government tiers) and transfers from more central government levels (OECD, 2017[28]).

Sub-central authorities increasingly engage in raising resources, allocating and managing school funding. While reliance on local tax revenues may enable better alignment between local preferences and needs and mobilising further resources for school education, it also risks creating inequities in funding across schools from different regions, states or localities, thereby requiring compensatory fiscal equalisation mechanisms to foster equity in and through digital education (OECD, 2021[29]). In addition, schools are also increasingly responsible over budgetary matters, which might result in higher inequities among schools if some schools lack the administrative capacity and preparation to deal with these budgetary responsibilities. However, little comparable information is available on the distribution of responsibilities for raising funds, allocating and managing resources related to digital education technologies in OECD or EU education systems.

The funding environment for digital learning in higher education differs substantially from that in the school sector. Funding and revenue models in higher education institutions vary across the OECD and within the EU. In 2018 – the most recent year for which consolidated international data are available – public funding sources accounted for an average of two-thirds (66%) of the revenue of higher education institutions in OECD countries, with a further 22% coming from tuition and fees paid by students (household expenditure) and the remaining 12% from a combination of other private and international funding sources (OECD, 2021[1]). Greater reliance on private sources of funding in higher education – including student fees in a number of countries – may also widen inequalities in access to available funding for investment in digital technologies.

Effective digital education requires a combination of current and capital expenditure

Digital education technology requires both current and capital expenditure. While the establishment of broadband connectivity and the acquisition of digital equipment require capital expenditure, other costs are likely to be recurring parts of education institutions' current expenditure, for example those for the professional development of education staff, the provision of technical support or the maintenance of hardware and software. To ensure efficient investments and a high quality of digital education, education systems need to allocate resources across both current and capital expenditures and strike the right balance between short-term and long-term investments.

The allocation between current and capital spending on digital education resources should reflect countries' digital education targets and their current state of digital education development. Striking this balance remains a challenge for many countries. When education institutions face trade-offs between current and capital expenditure, for example, there is a risk that long-term investments will be crowded out. Challenges can also arise when sub-central authorities or school leaders lack the capacity to assess the links between capital investments and maintenance funding (OECD, 2018[30]). In addition, the classification of some types of expenditure (e.g. for maintenance activities) as current or capital expenses, can be ambiguous (OECD, 2018[30]).

Education institutions receive funding for digital education through a range of allocation mechanisms

Although the overall level of investment in digital education matters, how funding is allocated and matched to learners' needs is equally crucial to promote access, equity, sustainability and efficiency. In school education, funds for education expenditure can be directed in several ways, depending on the type of expenditure (current and capital) and the discretion left to recipients (sub-central authorities and/or schools) on the use of the funding (OECD, 2017[28]; OECD, 2018[30]).[4]

Among OECD countries covered by the School Resources Review, for example, the most common allocation mechanisms for current expenditure at the school level funding include earmarked grants that require recipients to use the funding for specific purposes or items of expenditure, and block grants, which recipients can use to cover current expenditures at their own discretion. In the case of capital expenditure, the main allocation mechanisms include infrastructure investment programmes and ad-hoc grants.

Alongside their main funding allocation mechanisms, governments also rely on targeted programmes or grants that provide funding for specific purposes, education institutions, students or areas. During the COVID-19 pandemic, for example, a plethora of targeted programmes were implemented across OECD and EU countries to support access to Internet connection and digital devices for students from socio-economically disadvantaged backgrounds or rural areas.

The way in which funding for digitalisation is distributed – through the main allocation mechanisms or through targeted programmes – matters to ensure that funding reaches the education institutions and students who need it the most. While targeted programmes may be more flexible and responsive to changing priorities or emergency situations, a proliferation of targeted funding streams can lead to a lack of co-ordination, administrative efficiency and coherence, compared to the use, for example, of a central funding formula (OECD, 2017[28]; OECD, 2021[29]).

In higher education systems, public authorities nearly always transfer core operating funding to institutions as lump sums, without specifying the purpose of expenditure. Institutions pay for investments in digitalisation out of the lump sum budgets they receive, and government funders play no direct role in steering use of these funds. In higher education systems where governments use formula-based models to allocate funds to HEIs, one question relevant to digital learning is whether or not the formula used explicitly allocates funds for students enrolled or gaining credit in online programmes (and thus rewards and incentivises such provision). This appears to be the case in many OECD funding models for students

enrolled in online versions of degree-awarding programmes (short-cycle, bachelor's and master's degrees) in mainstream publicly funded higher education institutions, although such students generally represent a small proportion of total enrolment.

In **Finland**, the core funding model, which is formula-driven and allocates a proportion of funding based on credits gained in continuous education (lifelong learning), is flexible enough to recognise credits gained in online programmes. Such programmes are, nevertheless, marginal in the overall volume of learning activities. More generally, formula-based allocation models usually consider only students enrolled or gaining credit in accredited programmes that lead to a recognised degree. Whether or not such funding-eligible degree programmes can be delivered fully on line typically depends on accreditation and other regulatory policies rather than public funding policies (SURF, 2016[31]).

A special case is the treatment in funding models of open universities, which have traditionally concentrated nearly all distance education in countries where they exist. In some systems, these institutions are funded outside the core funding model, usually with a lower level of allocation per student. This is the case for the (public) Open University in **Portugal** (*Universidade Aberta*). In other systems, such as **Scotland (United Kingdom)**, public funding for education is provided to the local Open University on largely the same basis as to mainstream, campus-based HEIs.

Leaving aside the specific case of open universities, the comparatively small numbers of students enrolled in online or hybrid programmes in publicly funded HEIs mean that that information and research on how public funding systems handle such students has been limited, at least prior to the pandemic. However, emerging evidence from the 2022 edition of the OECD Higher Education Policy Survey shows that students following hybrid bachelor's programmes are entitled to access public grants and loans under the same conditions as fulltime campus-based students in 26 of out 30 responding jurisdictions. For fully online students, the share of students eligible for supports on the same basis as on-campus students is lower (19 out of 30 jurisdictions).

In addition, examples of targeted government funding for digital learning based on specific, time-limited programmes, are widespread in OECD higher education systems. In **Germany**, for example, the Foundation for Innovation in Higher Education Teaching receives EUR 150 million annually from the federal and state governments to award to HEIs in competitive calls for learning innovation projects (Stiftung Hochschullehre, 2022[32]). In 2022, the National Growth Fund in the **Netherlands** awarded EUR 560 million to a multi-annual project jointly run by the associations of universities, universities of applied science, higher vocational institutions and the national collaborative ICT organisation SURF to support digital learning in post-secondary education (Digitaliseringsimpuls Onderwijs, 2022[33]). In 2021, the **French** government awarded EUR 100 million to 17 "digital demonstrator projects" (*Démonstrateurs numériques dans l'enseignement supérieur* – DemoES) to fund strategy development, infrastructure and pedagogical innovation in public higher education institutions across France (Government of France, 2021[34]).

A highly fragmented digital education ecosystem can lead to procurement and budgeting challenges for education institutions

The investment ecosystem for digital infrastructure is highly fragmented and includes a multiplicity of potential buyers of education technologies, which makes it difficult for EdTech providers – especially smaller ones – to scale up and grow (see Chapter 6). This issue is exacerbated by the strong decentralisation of spending decisions. While the majority of initial funding for school education originates at the central level, in many countries, subnational governments are important actors in school funding (OECD, 2017[35]) (OECD, 2021[36]). On average across OECD countries, decisions related to resources within schools and in particular to budget allocations are relatively decentralised (mostly in the hands of school principals or school boards) (OECD, 2016, p. 334[37]). Some countries provide a high degree of resource autonomy to schools, enabling principals to allocate resources freely across areas of spending

(e.g. **Denmark**), whereas other countries (e.g. the **Czech Republic** and **Estonia**) display a more intermediate level of budgetary autonomy.

Yet, strategic investment decisions do not only require budgetary autonomy, but also technological expertise. Acquiring digital infrastructure entails budgeting for IT expertise not only for maintenance and support, but also for designing, installing, and commissioning goods and services. Every institution selecting digital technology is faced with the option of either building in-house IT expertise or outsourcing it. In small scale operations, such as those of schools and smaller HEIs, equipping institutions with (for instance) a highly skilled audio-visual department drives up the total cost of ownership and yields lower return on investment. Because outsourcing involves transaction costs and risks and provides less room for personalisation, larger institutions tend to invest in building their own IT expertise in-house.

Procurement strategies help institutions find a balance that works according to their needs and capacity. The extent to which institutions are able to make procurement decisions depends on the structure of grants and budgets. Lump sum grants may allow institutions to use the resources to buy components and individual pieces of equipment directly from a supplier ("box shifting") as well as IT expertise as part of the procurement ("service relationships"). Earmarked grants may restrict the ability of institutions to use dedicated resources for equipment on service relationships, forcing them to either fund those costs through other sources or undertake procurement decisions without the necessary IT expertise. Many institutions also engage in collective procurement processes, through national level agreements or through institution networks.

Finally, digital infrastructure has traditionally been considered to be capital expenditure, but some digital services may actually require a recurrent funding stream in light of their rapid change and replacement cycles. Cloud services and software subscriptions are examples of areas where one-off investments (e.g. in servers or software licences) are being replaced by recurrent expenditure. This shift in spending from capital to operating budgets can contribute to further fragmentation of the digital education investment process, as decisions for smaller current expenditures may be made at lower levels of an organisation – and less strategically than larger capital purchases, leading potentially to inconsistency or duplication of investments.

Promising approaches for funding and procurement of digital education technologies

Adapt funding and revenue models to digital education

Improve the identification of costs and benefits associated with developing and delivering digital education

The development and introduction of new forms of digitally enhanced learning is costly. As noted above, there have been few systematic attempts to quantify these costs at the level of school education and public higher education systems. Research into the costs of operating online and hybrid higher education programmes is scarce and the available evidence has gained limited traction in most policy making communities. Nevertheless, there is a strong case for further national level analysis of costs and efficiency gains related to digitalisation in education systems and for sharing the results of such analyses internationally.

In higher education, given the pervasive nature of digital technologies and the distribution of capital and staff costs across higher education institutions, it is unlikely that current institutional cost-accounting and reporting systems will allow for the collection of sufficiently fine-grained data on investment and development costs, even in systems where sophisticated cost-accounting models exist (OECD, 2022[38]). Evidence is more likely to be based on institutional level case studies. The large number of targeted funding

programmes focused on digitalisation currently underway provides an opportunity to analyse costs alongside programmes' effectiveness. More broadly, there is a case for further consolidating evidence on the costs of different approaches to digital learning and the dissemination of this information through international peer-learning.

Design core and targeted funding to education institutions with digital education in mind

As digital technologies increasingly permeate education systems, revising funding mechanisms may be necessary to achieve a more equitable distribution of funding for digital education. For example, including criteria to systematically allocate more funding for digital education to certain categories of education institutions or students may help to improve equity in access. In this context, the underlying data used as a basis for funding allocations are crucial. The availability and quality of data as well as the design and complexity of indicators are important determinants of the accuracy and efficiency of funding allocation systems (OECD, 2020[39]; OECD, 2017[28]). The extent to which education systems are able to measure digital capacity, the diffusion of digital technologies and the impact of digitalisation on education outputs and outcomes will determine the sophistication of information systems on digital education and in turn, the information available to make efficient adaptations to funding allocation models.

In higher education, once hybrid and online programmes have been developed and, where necessary externally accredited, there are few specific barriers to allocating public funding to HEIs for their delivery under established models. As most formula and voucher-like funding models use cost factors differentiated by study field (e.g. lower for humanities, higher for laboratory-based subjects), the question of which cost factors to use for online programmes will arise. In most cases, available technology does not allow programmes with practical elements to be delivered in fully online modes. Where fully online delivery is feasible, the evidence on operating costs and dominance of staff costs in overall operational costs suggest that online degree programmes should typically be funded with similar cost factors as on-campus programmes. **Scotland** provides an example of a flexible model (Scottish Funding Council, 2021[40]).

When it comes to development, piloting and testing new technologies and approaches to digital learning, an approach of competitive targeted funding can be a valid way to ensure efficient use of resources:

- In **Australia** the Digital Literacy School Grants is a competitive grant program that supports Australian schools in enhancing digital literacy among students and teachers. The program funds innovative projects that promote the development of essential digital skills. Successful projects in a recent funding round included a school-based Technology Design Centre for peer-led teacher training, supports for implementing the Australian Digital Technologies curriculum, and the purchase of a humanoid robot to provide additional learning support for students with special education needs (Department of Education Australian Government, 2021[41]).
- Similarly, a recent adaptation to the funding model for further education and training institutions In **Ireland** introduces a new discretionary "pot" of funds that allows institutions to compete for funding for innovative and transformational projects related to Government priorities, including those related to digital transformation (Department of Further and Higher Education, 2022[42]).

Governments in an increasing number of small and medium-sized jurisdictions use institutional performance agreements to agree and steer the investment priorities in publicly funded higher education institutions. These agreements are mainly regarded as a steering and accountability tool, rather than primarily a funding tool, although a small proportion of institutional funding may be explicitly linked to goals included in the institutional agreements. Digitalisation is one priority area that can usefully be integrated into institutional agreements. In **Austria**, for example, the latest rounds of institutional performance agreements (*Leistungsvereinbarungen*) concluded between institutions and the federal government have included digitalisation as one of a limited number of priorities. The agreements for 2022 to 2024 aim to achieve a significant expansion and development of digital learning (BMBWF, 2022[43]). The broad goals

established in the agreements have been complemented by targeted, project-based funding, as seen in multiple other OECD systems (BMBWF, 2021[44]).

Examine whether students enrolled in accredited online higher education programmes should be eligible for student support

In higher education, student financial support systems in OECD countries systematically use student and programme eligibility criteria. Both sets of criteria can be adjusted to widen or restrict the pool of programmes and the population of students that are eligible for financial support when enrolled on these programmes. Many, but not all, student support programmes distinguish between students who relocate to study on campus and those who enrol at institutions near home. Student aid programmes also tend to be more geared towards full-time rather than part-time studies.

Where online and hybrid programmes are considered within national regulations as equivalent to their on-campus counterparts, students may be entitled to have tuition fees covered but may not receive supports for living costs. In the **United Kingdom**, for example, students enrolled in distance education programmes with The Open University, are eligible for tuition fee loans, but not maintenance loans, as Open University students are *de facto* considered as part-time students, irrespective of their actual study intensity (The Open University, 2022[45]).

At the same time, online education programmes and their providers should be carefully assessed to ensure that the programmes being offered are delivering positive benefits for learners. For example, research in the **United States** has shown that many students availing of federal student loans in four-year online programmes offered by for-profit education institutions have poorer completion rates and outcomes and may be more likely to accrue unsustainable debt than students enrolled in other categories of institutions (Howarth and Stifler, 2019[46]).

Build institutions' collective capacity for purchasing digital infrastructure

Support institutional procurement strategies and budget practices

For education institutions, taking responsibility for the acquisition of digital education infrastructure requires them to have sufficient information, capacity and skills to navigate a wealth of EdTech products, services and tools, as well as an understanding of procurement procedures to make effective choices. Without proper information, institutions may end up acquiring technology that requires too much IT support or is too complex to use, leading to digital infrastructure underutilisation. Importantly, enhancing digital infrastructure is not a one-time investment but comes with continuous costs associated with maintaining and upgrading technologies acquired and providing the necessary support for their use (OECD, 2022[47]). Ensuring sufficient access to digital equipment and tools requires anticipating investment needs before shortages and inadequacies arise.

A way in which governments can bridge information gaps and can lower the costs of choosing among alternative technologies and providers is the provision of information platforms on procurement frameworks and EdTech providers. In the **United Kingdom** for instance, the Department for Education school procurement guidance service explains the benefits of using existing frameworks, proposes cost-efficient alternatives based on feedback from schools and supports compliance with the relevant procurement regulations (Gov.uk, 2022[48]). In addition, the government provides schools with digital and technology standards and is developing a tool to help schools to benchmark themselves and to identify technologies they should have in place (Department for Education, 2022[49]). This type of intervention supports the principle on data integration to inform investment strategies and produce evidence for decision-making as outlined in the OECD Recommendation of the Council on the Governance of Infrastructure (OECD, 2020[50]).

Education institutions also benefit from collective capacity building for digital planning and acquisition. Most universities and colleges in the **United Kingdom** belong to a charitable company, the Universities and Colleges Information Systems Association (UCISA) that provides members with case studies, surveys, toolkits, best practice guides and benchmark reports to inform the development of digital capabilities. This includes, for example, a Procurement Group that advises on digital technology acquisition decisions, and a Digital Infrastructure Group that advises on technology and services that sit between networks and end-user applications (UCISA, 2022[51]).

Align procurement strategies to governance arrangements and the degree of institutional budgetary autonomy

As discussed previously, countries give education institutions different degrees of freedom in choosing suppliers for their digital infrastructure needs. In this context, procurement practices and options are also likely to vary, albeit within the common objective to achieve scale economies and efficiency gains wherever possible.

At one extreme of this spectrum is a highly centralised procurement approach, whereby a state agency buys digital systems and equipment on behalf of all the institutions in the national education network. For instance, in **Hungary**, all public HEIs' procurement requests are considered, prioritised and acted on by a national agency (OECD, 2021[52]). A centralised process can reduce the complexity and risks of procurement systems; improve efficiency and ensure systems are interoperable. A centralised strategy may also be suitable when institutions have low internal capacity and resources to dedicate to a procurement strategy. However, for institutions that can build that capacity, centralised services can be perceived as inflexible, slow and unable to tackle requests not prioritised in the national agenda (OECD, 2021[52]).

In more autonomous systems, by contrast, governments allow education institutions to decide on their digital infrastructure investments. There, the use of purchasing consortia or framework agreements for digital infrastructure purchases appears as a cost-effective approach to achieve efficiency gains in procurement management.

- In the **United Kingdom**, public higher education institutions have autonomy to manage their digital infrastructure and can make use of multiple national and regional procurement frameworks including the "open frameworks for educational technology" through the Crown Commercial Service (Crown Commercial Service, 2022[53]). Institutions can also form purchasing consortia for collaborative procurement including among regional consortia as in the case of the UK Universities Purchasing Consortia, a formal entity formed by eight UK regional consortia to support collaborative procurement within Higher and Further Education (UKUPC, 2022[54]).
- The **Flemish Community of Belgium** established a framework agreement with the private telecom sector and software resellers to provide better conditions for educational institutions (van der Vlies, 2020[55]).

Other countries, at the higher education level, have opted for centralising only a limited range of digital services that are less subject to personalisation and have an overarching impact on the security of the system. In **Norway** for instance, the Norwegian Directorate for ICT and Joint Services in Higher Education & Research (UNIT) offers a common digital architecture to centralise, harmonise and standardise services related to security and access (UNIT, 2021[56]), but gives institutions freedom to choose services that can be tailored to their needs such as LMS and Virtual Learning Environments (VLEs) (OECD, 2021[52]). Additionally, in 2017 the National Research and Education Network including 17 Norwegian HEIs managed the procurement of Canvas (a LMS) to simplify the procurement process for individual institutions, effectively leading to convergence in use of LMS across HEIs.

Comparative evidence on the procurement practices for education technology is, however, currently lacking. Collecting such evidence would entail a better understanding of how different practices better support education systems in acquiring education technology. Indeed, if more decentralised procurement practices enable schools or agencies to benefit from flexibility in choosing products and tools aligned with their specific needs, they also entail higher sales costs for companies, more difficulty to navigate a variety of procurement procedures and fewer opportunities to scale as demand remains fragmented.

Support value for money investments and economies of scale in procurement through partnerships and procurement collaboration platforms

Networking and collaborative procurement platforms and associations provide a flexible way to standardise procurement practices and negotiating better prices:

- In **the Netherlands,** the government provided a start-up 5-year subsidy to SIVON, a co-operative association of school boards that supports purchasing of digital education resources, including through the provision of framework agreements with providers leading to lower costs for schools (Nederland Digitaal, 2022[57]). In higher education, SURF (a collaborative organisation) relies on a combination of peer learning and expert advice to guide digital infrastructure choices of over 100 member institutions (SURF, 2022[58]).
- In **Lithuania** and **Croatia**, consortia and NRENs provide centralised hosting services such as Zoom and Moodle on top of providing network connectivity (LieDM, 2022[59]) (CARNET, 2022[60]).
- **Ireland**'s NREN HEAnet brokers hardware, software, support and professional services on behalf of HEIs, effectively streamlining procurement processes and negotiating aggregate deals from which all members can benefit (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2017[4]).
- Several NRENs in Europe support the purchasing of cloud services and GÉANT offers framework contracts for institutions to buy cloud services without running their own tender or call-for-competition (Géant, 2022[61]).[5]

Key Messages

Understanding the costs associated with investments in digital education is a precondition to evaluate their efficiency. Yet, the analysis in this chapter highlights that policy makers in many countries have limited information on the extent of public spending on digital education. Adapting budgeting and accounting practices to better track expenditure related to digital education might be a first step to improve the knowledge base underlying digital investment decisions.

In addition to the amount of spending, the ways in which funding for digital education is raised and allocated is essential to facilitate the successful digitalisation of education institutions. For instance, drawing funding for digital education primarily from revenues raised at sub-central levels might result in investment disparities based on differences in local revenue-raising powers and preferences.

Digital education spending comprises both large one-time investments and recurring costs (e.g. associated with the maintenance of digital equipment). This requires institution-level and system-level budgeting to be forward-looking and to take into account both capital and current expenditure.

Funding allocation mechanisms for digital education also need to strike a balance between providing reliable financial flows to education institutions to cover recurring costs and maintaining the flexibility to enable targeted funding for specific investments. This is particularly relevant given the fast-changing technological environment, which can lead to unexpected funding needs.

Finally, fragmented markets for digital technologies might inhibit education institutions' ability to make effective and cost-efficient procurement decisions. As discussed in Chapter 3, individual education institutions might lack the capacity to select adequate education technologies and their limited bargaining power can prevent them getting the best value for money. This chapter therefore presents a range of measures, such as purchasing consortia or standardised framework agreements, to support education institutions in the procurement process.

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Notes

[1] Current expenditure is defined as “spending on staff compensation and on “Other current expenditure”, i.e. on goods and services consumed within the current year, which require recurrent production in order to sustain educational services (expenditure on support services, ancillary services like preparation of meals for students, rental of school buildings and other facilities, etc.). These services are obtained from outside providers, unlike the services provided by education authorities or by educational institutions using their own personnel” (OECD, 2021[1]).

[2] Capital expenditure is defined as “spending on assets that last longer than one year, including construction, renovation or major repair of buildings, and new or replacement equipment. Neither capital nor current expenditure includes debt servicing” (OECD, 2021[1]).

[3] For the 22 EU countries with available data, on average 78% of current expenditure was dedicated to staff (63% to teachers and 15% to other staff, including support, professional and research staff) and 22% to other current expenditure.

[4] Funding for current expenditure can be allocated funds through a range of mechanisms (lump sum transfers, earmarked funding, block grants, etc.) and funding formulas are often the major basis for determining the amount of funding to be distributed for current expenditure. For capital expenditure, the main allocation mechanisms include infrastructure investment programmes, ad hoc administration of grants and competitive processes. The assessment of needs is often the major basis for the allocation of funding for capital expenditure.

[5] The framework contracts comply with EU data protection law and were established using the EC 2014/24/EU procurement directive, which allows you to use the services directly