College and University Sector ICT Strategy 2019 – 2021

Foreword from Co-chairs of the ICT Oversight Board

This ICT Strategy is a result of large scale collaboration and consultation within the Scottish college and university sector. I encourage you to read and use this document in your institutions, especially in a time where the demand for IT, technology and digital innovation are increasing, but pressures on IT and operational costs are very demanding. A strategy such as this can help focus your internal priorities, provide ideas and helpful insight. There are many areas where sector-wide services, shared services, best practice and other collaborative approaches should be considered. This document talks about key areas you should consider within your own strategy and gives examples and ideas of some collaborative, best practice and sector shared services you may want to consider. One of the true strengths of the college and university sector lies in its ability to cooperate. I hope you find this Sector ICT strategy of assistance.

Gavin McLachlan

Chief Information Officer and Librarian to the University of Edinburgh

Scotland's future investment in economic development, research and inclusive growth will be determined by, amongst other things, how we take forward investment, awareness, accessibility and enabling digital. Digital in all its forms: data management, skills development, sustainable infrastructure, cyber security, pragmatic shared services and most importantly, a digital learner journey available and enjoyed by all. Scottish tertiary education, its universities and colleges, has a fantastic opportunity to lead the development and understanding of digital for all ages and abilities. Through collaborations and partnerships, through innovation, improved productivity and efficiencies, our sector can be leaders – we can already evidence fantastic examples and case studies of effective and innovative ICT solutions where the whole is so much more impressive than the parts.

This Sector ICT Strategy sets out a collaborative and interdependent approach with key objectives as to how we can and will work together for economic development and innovation, to improve our public services, keep data management effective, simple and safe, target appropriate investment with a sustainable infrastructure and invest in future generations through digital participation and inclusion. This three year strategy sets out a clear digital path for the future of our sectors, our students and our staff, and ultimately will benefit the economic growth of Scotland.

Dr Ken Thomson

Principal and Chief Executive, Forth Valley College

Introduction

1. This Strategy has been developed by the Further and Higher Education ICT Oversight Board, which oversees national level actions and collaboration on ICT, working with Jisc, UCSS-ISSC and others.

2. The focus of this strategy is on activities or services which may be best organised or procured at a national level. These can include infrastructure, collections, advisory and production services. Colleges and universities have diverse academic profiles, local contexts and campus infrastructures, and have autonomy in all aspects of their ICT operations. Participation in any sectoral or national service is on a voluntary basis.

3. The aims of this Strategy (and of *Realising Scotland's full potential in a Digital World*, published in March 2017) cannot be achieved by ICT departments working alone. In many cases a whole institution approach is required.

4. Service quality, security and accessibility are key. Improvements in ICT efficiency and productivity should be enabling, and include improved responsiveness, personalisation and usability.

5. This strategy supports and aligns with: the work of USET, SFC's International Strategy, the 10 Year Infrastructure Strategy, and the work of the joint SDS/SFC Skills Committee (including related bodies like the Digital Skills Partnership).

6. Our priority focus is on the contribution of universities and colleges to digital skills, research and knowledge exchange for Scotland's economy. At the same time we will continue to seek improvements and efficiencies from more co-ordinated procurement and deployment of ICT resources.

Section 1: Skills

7. This section addresses two broad skills challenges: the overall supply of people with the right digital skills, and frameworks for those skills in a context of rapid change.

8. *Realising Scotland's full potential in a Digital World* estimates that 12,800 additional digital skills roles are needed each year, and has established a Digital Growth Fund[1] to offer loans to companies who wish to develop the digital skills of their staff in areas such as cyber security, data analytics and software engineering. SDS is supporting Graduate Level Apprenticeships (SCQF levels 10 and 11) as pathways in IT and cyber-security.

9. The pace of ICT development and skills shortages in key areas is making it increasingly challenging for institutions to recruit ICT staff[2]. This makes it important for universities and colleges to invest in CPD and changing job roles, especially in emerging areas like Cloud architecture, security and contract management. The HE Academy report (Whose job is it

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[1] https://news.gov.scot/news/increased-funding-for-digital-skills
[2] http://www.ucea.ac.uk/en/publications/index.cfm/hews2017

anyway?[3]) and SFC's Gender Action Plan[4] note a continuing gender imbalance in IT roles, with significant under-representation (<25%) of females on computer science courses.

10. Digital literacy is now an essential component of life-long learning. This includes specific ICT skills and a broader skill-set, relating to personal and cyber-security, information literacy and digital skills for effective teaching and learning. Everyone needs to be able to work smarter at a distance; to discover, collaborate, create and manage data, and to understand how to use, share, re-use and publish onto the open web.

11. Beyond this is a diverse range of ICT specialisms which people pursue as personal or professional development. Universities and colleges can support this by providing open systems and educational resources for training, and via an aspirational culture of skills development achieved through formal and informal processes.

12. Digital Capability Frameworks (from Jisc[5], UCISA, ALT and SFIA) enable benchmarking and setting objectives for digital skills. There are also various well-defined digital competency frameworks for learners (in the UK and from the EU) for 'educational citizenship'. It would be useful to adopt a model that can be used across life-long learning as a vehicle for driving staff and learner development.

13. Scotland's established staff networking groups (UCISA, HEIDS, SCIL, ALT, SCURL, SCONUL, etc) are well-placed to consider the CPD implications of changing job roles, and whether there is scope for nationally co-ordinated provision.

AIMS & OBJECTIVES – we will:

- ❖ share information on ICT vacancies in colleges and universities;
- ❖ promote equality and diversity and address the issues identified in the Gender Action Plan;
- ❖ share effective approaches to developing cyber-security and digital literacies;
- ❖ consider the potential role of skills frameworks (e.g. SFIA, D-DAT, C-MALT) in benchmarking and setting CPD objectives;
- ❖ work towards a set of common definitions for digital skills in Scotland, drawing on existing frameworks for digital literacy for learning, life and work;
- ❖ provide opportunities for apprenticeships, interns, and collaboration with academic projects;
- ❖ support the use of open licences to share digital skills and training resources and consider adopting the Open Scotland Declaration (to put the sharing of publicly-funded learning materials on the same open footing as publicly-funded research), and
- ❖ explore the scope for nationally co-ordinated CPD for both end-users of common systems and for Digital / ICT professionals.

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[3] https://www.heacademy.ac.uk/knowledge-hub/whose-job-it-anyway
[4] http://www.sfc.ac.uk/web/FILES/Corporate_publications_SFCCP052016_GenderActionPlan/SFCCP052016_Gender_Action_Plan.pdf
[5] https://www.jisc.ac.uk/rd/projects/building-digital-capability

Section 2: Economic Development and Innovation

15. Universities routinely translate their world-class research into economic and social benefits for Scotland, collaborating with businesses and others to enhance innovation across Scotland's key economic sectors. Universities and colleges also see great opportunity to contribute to economic development by catalysing inward investment and City Deals. The development of productive links between business and academia in areas like Big Data, Digital Health and the Internet of Things will play an increasingly significant role in realising Scotland's international trade ambitions.

16. Disruptive technologies (including virtual reality, artificial intelligence, augmented reality and foundational technologies like blockchain) are already changing the world of work and present risk and opportunity to established organisations. Universities help to keep Scotland at the cutting edge by supporting research and knowledge transfer in these technologies. They are not immune from pressures to transform and re-engineer their operations to remain competitive, and must seek to be early adopters of these technologies.

17. Universities and colleges also play a critical role in economic development by helping students to start digital business ventures, providing space, support and advice for growing companies. Notable successes in digital student spin-outs can be seen in areas like Robotics and Cyber-security.

18. Universities and colleges also play significant local civic roles. To support this, IT Services need to be outward-looking and support local partnerships and businesses to develop their digital skills. Examples of this are the STEM Hubs, which will help to deliver Developing Scotland's Young Workforce.

19. Our national infrastructure (e.g. Janet & SWAN) must continue to enable these diverse activities, which increasingly take place outwith the physical campuses of the institutions.

AIMS & OBJECTIVES – we will:

- ❖ maintain secure environments whilst opening up services as far as possible to engage and support the public, and to explore new and disruptive technologies;
- ❖ support the training of business and local communities through the Digital Participation Charter and STEM hubs;
- ❖ add transformational value to established businesses through technology transfer;
- ❖ support digital start-ups through IT services, physical space, training and mentoring; and
- ❖ encourage communities to make the best use of our open research and open learning content.

Section 3: Digital Public Services

20. *Realising Scotland's full potential in a Digital World* set out a vision for seamless public services which enable easy access and collaboration across organisations. Universities and colleges are well-advanced in offering services online using national authentication to enable access to students and staff from other institutions. More could be done to enable access to other users, such as providing training to NHS staff, working with schools, and providing services to the public.

21. Accessibility can be improved by making more services consumable on any device, and by implementing integrated identity management and roaming services (Eduroam, GovRoam) across public sector providers. Use of the National Entitlement Card could be expanded. Agreed access protocols and platforms will enable universities and colleges to deliver CPD and learning seamlessly in partnership with the NHS and other organisations.

22. Digital can transform learning environments to enable learners to access different types of learning opportunities and materials that are best suited to their goals and learning styles. We need to understand the ongoing costs of sustaining such environments.

23. Some trends are driving a reduction in the physical size of the IT estate. SaaS and IaaS offer advantages in increased efficiency and ease of management, and for some institutions the growth of BYOD is reducing the need for large scale PC labs. However many students will still require institutions to provide a PC, and BYOD introduces additional information security threats that need to be considered. Over time these changes might offer scope to reduce the physical footprint of ICT infrastructure on college and university campuses, and enable change of use of some space.

24. The SFC's Capital Policy Framework reviews sectoral capital investment needs over the medium to long term. We recognise the continuing challenge to maintain the sector's estate and facilities with current levels of funding. Indeed, not updating/upgrading ICT presents several risks (e.g. to security, and student engagement), particularly as the 'network edge' grows. There is a need to better understand sector investment needs and service design options.

25. In 2014 we established the Universities and Colleges Shared Services Information Services Catalyst (ISC), to scope and offer shared IS services to institutions, through the mechanism of a cost-sharing group. To date, hosted VLE, a cross-sector online Digital Skills Training Register and Chief Information Security Officer shared services have been established. Future priorities are likely to be data storage, and shared staff capacity for enterprise architecture and data protection.

26. We will continue our pragmatic focus on shared service opportunities in order to make best use of scarce resources and deliver services most efficiently across the HE/FE sectors. We will also seek to increase the sector's influence on re-sellers to improve supplier

management, and the nature of service offers to colleges and universities (e.g. on SAAS, and browser-based applications requiring no local client).

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AIMS & OBJECTIVES – we will:

- ❖ improve user mobility and service accessibility by making more services consumable on any device, implement integrated identity management and roaming services;
- ❖ increase the use of common access protocols to deliver seamless services for staff, students and other users;
- ❖ consider hosting Collaborative Catalyst resource within UCSS to explore opportunities for shared services and to explore and assist in other collaborative endeavour that will enhance the quality or efficiency of digital services;
- ❖ refine the roadmap of priority shared services to be explored by ISC over the next 5 years (likely to include project management, enterprise architecture and business improvement services); and
- ❖ estimate the potential scale of opportunity and set an aspirational target for the 10 year sector Infrastructure Strategy, highlighting the transformative potential of digital to improve quality and deliver an excellent student experience, whilst enabling change of use of parts of the physical estate.

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Section 4: Data

27. Key sectoral challenges around data include reducing complexity and inefficiency in the processing of student data, and using data to better support learners. The HESA Data Futures work, and its commitment to open data by 2020, will make the handling and re-use of data more efficient and improve the evidence base for decisions and student support.

28. As part of its work on data and analytics, Jisc has created a secure Learning Data Hub to hold institutional data including student records data. The Learning Data Hub will support multiple tools and layers to be built on it, starting with learning analytics aimed at improving student retention and attainment by improving the support offered by institutions. It includes an app for students to allow them to maximise their learning potential by tracking their learning activity. Once completed, Jisc will move onto the next phase which could include creating dashboards for multiple purposes, including returns to statutory bodies and new ways of processing and reporting on course applications.

29. Jisc's work could also support the Scottish Government's objectives for more efficient and informed Learner Journeys. In a future where students will engage in learning with a wide range of providers throughout their lives, it will be increasingly important to enable data to travel with the learner, to support their reflective lifelong learning, and inform both course provision and learner choice, supporting a personalised learner journey. It should also

improve transitions and support. It will be important to consider the progress of Jisc's learning data hub and its potential application to the Learner Journey agenda.

30. Significant efficiencies could be achieved by improving the portability of student records, promoting the wider use of sector data standards by Government agencies to reduce the burden on institutions, and exploring the potential of Blockchain technologies.

AIMS & OBJECTIVES – we will:

❖ capitalise on the Jisc and HESA Data Futures work around a unique student identifier, in-year collection and processing, and open data;
❖ promote the use of common data standards to improve the portability of student information
❖ review use of other sources (e.g. Linkedin) of data on student skills and achievement work with IS Service Catalyst to investigate the feasibility of a shared Data Protection service, and
❖ ensure that the sector understand the changes that the GDPR brings and will encourage individual universities and colleges to create appropriate action plans to be able to comply with the requirements by May 2018 and to have robust arrangements to maintain this compliance as core operational processes (see annex B).

Section 5: Information Security

33. Scottish universities and colleges note that the Scottish Government recognises the challenges facing the sector as we address the cyber security threats facing a digitally-enabled society. Achieving the correct balance between 'openness' and effective information security controls is key to being able to drive real benefit from developing areas such as the Internet of Things, Blockchain, Artificial intelligence/machine learning and augmented/virtual reality. Nevertheless, the cyber threat is real and growing, and cyber resilience is viewed by Scottish universities and colleges as a fundamental enabler of our digital ambitions.

34. Scottish universities and colleges benefit from well-established security arrangements delivered nationally across the Janet core infrastructure and complemented by institutional measures. The ever changing cyber threat will continue to need increased investment in mitigating measures across the sector's shared network infrastructure, and in local, risk based, cyber controls.

35. The creation of a Chief Information Security Officer (CISO) shared service (delivered via UCSS-ISSC) has provided options for access to specialist advice and services for participating universities and colleges, with the expansion of dedicated teams in some universities and colleges providing additional focus.

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[6] https://www.ed.ac.uk/records-management/about/external-representation/sheip

36. Universities and colleges are delivering major parts of the Scottish Government's Cyber-resilience strategy, drawing on areas of research excellence, growing tomorrow's cyber companies and providing training. We will continue to support an active relationship between the Scottish Informatics and Computing Science Alliance (SICSA) and the Scottish Government, aiming to act as exemplar organisations in providing safe spaces for digital services and innovation. We will actively support the development and implementation of the Scottish Government's cyber resilience action plans in learning and skills and economic opportunity.

AIMS & OBJECTIVES – we will:

❖ We will continue to work with Jisc to optimise investment in the network infrastructure to maintain its resilience to the growing cyber threat. We will develop the shared service CISO, for example to offer more tailored, on-demand services for participating institutions. We will actively support the Scottish Government's Cyber resilience agenda, including involvement in the cyber catalyst scheme (University of Edinburgh, University of Aberdeen, University of St Andrews, Fife College and Forth Valley College), and aim to optimise security arrangements at UK, Scotland and institutional levels.

❖ To meet Scottish and UK Government requirements to have demonstrable cyber security controls in place, we will encourage universities and colleges to align their work on cyber resilience with the Public Sector Action Plan on Cyber Resilience[1], and the planned Public Sector Cyber Resilience Framework (when finalised). As part of this work, we will examine options for certification/accreditation against agreed standards such as Cyber Essentials, Cyber Essentials Plus or ISO 27001. The adoption of the controls within these schemes will enhance core cyber resilience within individual institutions and will also provide assurance to third party partners and internal users.

❖ We will continue to work collaboratively across the sector, and beyond, to share threat information, utilising membership of the National Cyber Security Centre, CiSP scheme, whilst leveraging the HEIDS IS network of sector contacts to share experiences and good practice guidance. Additionally, to drive further benefit across the sector, we will share training and awareness resources and exploit digital training solutions where possible. We will also encourage joint initiatives to allow sharing of costs and will foster contacts with other sectors to gather broader experiences that might benefit individual institutions or the broader sector.

❖ We will examine options to create a combined security operations centre, either within the sector or utilising existing public sector services, to better manage security incidents affecting multiple institutions.

Section 6: Infrastructure

37. Institutions are investing in digital infrastructure to deliver learner services on and off campus, and to enable more flexible delivery and personalisation; in short - the modern

digital learning experience that students increasingly expect. Enhancement of information services comes at a cost. There is little point introducing services only to withdraw them when the cost cannot be sustained. We need to better understand the costs and annual investment required to maintain quality digital learning environments.

38. Jisc has been a key delivery partner in developing digital services and innovation in further and higher education for over 25 years. With the continuing pressure on public funding, it is increasingly important that we achieve value for money and focus central investment on sector priorities. We will engage more closely with Jisc on the priority areas to be pursued in Scotland, taking account of complementary offerings from UCSS-ISSC and *Realising Scotland's full potential in a Digital World*.

39. Of critical importance to Scotland's science and innovation base is access to a world-class, scalable and secure research network, linked to other National Research and Education Networks (NRENs). We will continue to invest in the Janet backbone and regional networks to ensure the stability of the core infrastructure.

40. The SWAN network was established in 2014 and now provides connections for a range of public sector bodies including some of Scotland's colleges. It is helping to increase competition in the market for public sector broadband and offers scope for greater resilience in institutional network links through diverse routing. We will continue to review the SWAN service offer and seek best value for money from our investment in national network infrastructure. We will promote a vision for the future of SWAN, based more on shared ownership of the service.

41. We welcome the Scottish Government's plans to bring superfast broadband to 100% of premises in Scotland by 2021, with priority given to rural areas.

42. The Scottish Government's Data Hosting and Data Centre Strategy promotes the aggregation of demand and economies of scale. There is no shortage of supply. We will work to understand the sector's available data storage capacity, and opportunities for co-location and greater energy efficiency from data storage.

AIMS & OBJECTIVES – we will:

❖ continue to fund centrally the Janet backbone and regional networks to enable world-class research and international collaboration;
❖ review SWAN for value for money and seek to influence the evolution of SWAN (with a view towards shared infrastructure rather than separate contracts for services),
❖ review the sectoral (and other public sector facilities where possible) data centre landscape to identify available ultra-low carbon capacity and promote sharing by other institutions across the HE/FE sector; and
❖ phase out sectoral use of data centres which fall below our benchmark [1] for energy efficiency.

Section 7: Digital Participation and Inclusion

43. Universities and colleges support diverse populations of students and staff, and have made great progress in making information services accessible and progressing equalities online and offline. As digital becomes the default environment for offering learning, research and support, it's essential that services are accessible to all users, and from any device and location.

44. Updating and enhancing the IT skills of Scotland's people is vital if we are to make the most of digital opportunities. Universities and colleges are committed to the continued development of digital skills for their staff and students, as well as playing their part in community-based initiatives.

45. In line with the UNESCO OER Action Plan[7], we will promote the use of Open Educational Resources (OER) and Open Badging initiatives to support both formal and informal learning that is equitable, inclusive, open and participatory. We are committed to the aims of the Digital Participation charter[8] and the Scottish Open Education Declaration[9].

46. Student partnership and engagement are distinctive strengths of further and higher education in Scotland. Involving students in the design of services which affect them makes good sense from a variety of perspectives. We will promote co-design as a principle in the development of student-facing services. The '5 (Digital) Rights' identified by the Youth Commission[10] are useful reference points for the design and governance of digital services.

> AIMS & OBJECTIVES – we will:
>
> ❖ make Information Services open and accessible, ensuring they are represented and visible to students and staff at forums and that IS staff are actively engaged in institutional life to better understand users' needs and requirements;
>
> ❖ support the use of open licences[1] for all educational resources created with public funding;
>
> ❖ promote common ICT core skills and online learning (over and above core educational requirements) to develop personal digital skills, embedding relevant elements from the EU and Jisc frameworks to promote the development of learner and staff skills, and
>
> ❖ involve students in the design and development of student-facing digital platforms, ensuring they meet usability and accessibility requirements, and address the 5 Digital Rights.

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[7] UNESCO, Ljubljana OER Action Plan
https://en.unesco.org/sites/default/files/ljubljana_oer_action_plan_2017.pdf
[8] https://digitalparticipation.scot/the-charter
[9] Open Scotland, Scottish Open Education Declaration, http://declaration.openscot.net/
[10] https://www.youngscot.net/wp-content/uploads/2017/05/Five_Rights_Report_2017_May.pdf

Governance Map

ISIB	Places Board	**Scottish Government Ministers** Provide Ministerial direction and budget resources to deliver key programmes and projects

Scottish Leaders Forum

Digital Public Services Sponsor Board
Sponsors and advocates in support of the development and delivery of the DPS elements of the Digital strategy.

Provide leadership and sponsorship and where necessary advice on whether sectoral progress and conditions of success are in place.

Sector Boards

Reporting on overall progress and implementation on sectoral strategies

DPS Advisory Board
Industry reps

CGTAB

T&D Board

Digital Directorate Senior Management Team
Discuss Portfolio assurance 4 times a year, escalation from DPSBT SMT

Digital Engagement Forum
New cross sectoral forum

SWAN Programme Board

DPSBT Senior Management Team
Discuss Programme assurance bi-monthly, prioritisation, interdependencies, benefits, risks and budgets

Portfolio Management Office
Report progress within each of the core national programmes via exception reporting

GDPR: Key Changes

- Data subject consent. Needs to be informed, specific, unambiguous, cover all specific use cases and given freely. Institutions will need to be able to evidence that consent has been given and can no longer rely on 'opt-out' boxes ie can no longer assume that lack of objection constitutes agreement. Increased onus on requirement to comply with withdrawal of consent. Note – where existing processing is based on consent, it is not necessary to obtain fresh consent if this was given in line with the GDPR requirements. Consent must be 'explicit' if data is sensitive.

- Definition of personal data expanded to include IP address, biometric data, mobile device ID and genetic data, if they can be linked back to an identifiable individual.

- Breach reporting to supervising authority (ICO for UK) timelines reduced to 72 hours from discovery, with notification to affected individuals where the incident could cause them serious harm.

- Fair processing/privacy notices need to be reviewed to ensure they include details of all types of processing for which the data will be used throughout its lifecycle.

- Register of personal data – need to know where data is collected, stored, processed and shared and be able to delete or transfer it to another processor if asked to do so by the data subject.

- Privacy by design principles are needed for operation or research us of personal data and must include:

  - Privacy impact assessments
  - proactive approach, with prevention at core
  - Privacy as the 'default' setting (fail safe)
  - Privacy embedded into design
  - End-to-end security
  - Visibility and transparency
  - Data subject-centric
  - Pseudonymisation and encryption of personal data.

- Data security – need to have 'state of the art' technical and organisational controls in place, including additional obligations to take the following steps, where appropriate (i.e. not needed in all cases, but based on privacy impact assessment):

- Ensure ongoing confidentiality, integrity, availability and resilience of IT systems to protect personal data
- Ability to restore availability and access to personal data in a timely manner in the event of a physical or technical incident
- A process for regularly testing, assessing and evaluating the effectiveness of control measures in place

Glossary of Terms

APUC – Advanced Procurement for Universities and Colleges
BYOD – Bring Your Own Device (allows users to connect using their own device)
CISO – Chief Information Security Officer (a shared service)
DPS – Digital Public Services
D-DAT – Digital, Data and Technology (a skills framework)
GDPR – General Data Protection Regulation
HEIDS – Higher Education Information Directors Scotland
HESA – Higher Education Statistics Agency
IaaS – Infrastructure as a Service (cloud/externally-hosted infrastructure services)
ICT – Information and Communications Technology
Jisc – UK body providing digital services to universities and colleges
NREN - National Research and Education Network
SaaS – Software as a Service (cloud/externally-hosted software)
SCIL – Scottish Colleges Information Leads
SDS – Skills Development Scotland (funding for training in Scotland)
SFC – Scottish Funding Council (funds universities and colleges in Scotland)
SFIA – Skills for the Information Age (a skills framework)
SHEIP - Scottish HE Information Providers
SWAN – Scottish Wide Area Network (a public sector network)
UCISA – Universities and Colleges Information Systems Association
UCSS – Universities and Colleges Shared Services
USET – Universities Scotland Efficiencies Task Force
VLE – Virtual Learning Environment (an online learning platform)