Edinburgh College

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IT INFRASTRUCTURE & SYSTEMS STRATEGY 2018 - 2023

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1. EXECUTIVE SUMMARY

This Information Technology (IT) strategy describes a framework which aims to maximise the effective contribution of IT in delivering the Edinburgh College Strategic Plan for 2017-22. IT systems are a driving force for much of the activity within the College and this document sets out to describe the principles, initiatives, and technical and architectural plans which can be used to show how IT services are delivered, and to guide IT decision-making over the next five years. The rate of technological change will be more dynamic than the timeframe of this strategy; as a consequence, the details of specific technological advances are not included within the scope of this document. IT delivery will be aligned to institutional objectives.

2. BACKGROUND & CONTEXT?
Where are we now?

2.1 Infrastructure

The College network is spread across four campuses and two outreach centres, all of which are joined together by encrypted private networks. In each campus, the wired Local Area Network (LAN) is made up of a variety of different Cisco switch models supporting a combined total of approximately 5,000 endpoints across campuses. The wireless networks consist of Cisco Meraki access points with an average of 1,200-1,300 clients per day spread across all campuses.

The age and suitability of the IT infrastructure, data centres and cabling varies across the campuses.

Networks

Milton Road Campus
The network core consists of two ten-year-old Cisco 6500-series switches. There are 35 access-layer switches, the majority of which are also 10 years old. A refresh of the network hardware is due for this campus.

Midlothian Campus
The network core consists of one Cisco 6800-series chassis installed in July 2018. There are 12 10-year-old access-layer switches which are scheduled for replacement this year.

Sighthill Campus
The network core consists of two Cisco 6500-series chassis which are 13 and seven-years-old. There are 75 access-layer switches, the majority of which are between 12 and six-years-old. A refresh of the network hardware is due for this campus.

Granton Campus
The network core consists of two Cisco 6800-series chassis. There are 63 access-layer switches. Both the core and the access-layer were refreshed three years ago.

Wireless Networks
The separate wireless networks from different vendors across all College sites were replaced with a single solution with the latest generation of access points in 2015. There are 271 wireless access points in total which are expected to be supported until October 2023.

Virtualisation
The virtualisation infrastructure consists of two resilient hardware clusters, one at Milton Road and the other at Sighthill Campus. Each cluster contains hosts servers, the majority of which were purchased between 2008 and2010 -together these service over 250 virtual servers. A hardware refresh is due for these systems.

Storage
The primary data storage consists of two separate IBM v7000 Storage Area Network (SAN) appliances at the Sighthill and Milton Road campuses. These units were purchased in 2015 and extended in 2016 and 2017. Depending on the rate of cloud adoption over this strategy period, it may possible to reduce the size and cost of these systems.

Communications
The current communications infrastructure is a complex mixture of ageing private branch exchanges, software solutions running on

hardware servers purchased between seven and nine years ago, middleware servers purchased in 2013, and session branch controllers added in 2015. A hardware and software refresh is due for these systems.

Backups

The separate backup systems across the campuses were merged together in 2015. The majority of the hardware was upgraded between 2015 and 2017, although some hardware from 2011 is still in service which will need to be replaced upon failure. Managing a large and complex backup system is a challenge for the in-house IT team.

Desktop estate

The College has been consolidating the number of different workstation models from various vendors and the desktop estate is comprised of primarily HP PC workstations and laptops, and Apple Macs. Across all of the campuses there are approximately 3,700 PCs of which 1,350 are more than five years old, 1,745 laptops of which 1,300 are more than five years old, and 530 Apple Macs of which 51 are more than five years old.

Audio-visual estate

There are approximately 400 classrooms that include some level of audio-visual provision, varying from a PC with a large screen attached through to the latest interactive panel technology. In excess of 75% of this equipment is over five years old, with some nearly double that. New provision is, wherever possible, purchased with a projected ten-year lifespan.

2.2 Business applications and systems

Identity and access management

All staff and student logins are now in one single Active Directory domain. However, identity management across College directories and applications relies on several different systems and manual processes which are not always well understood. Out-of-date user information in some of our systems creates operational and security problems. The IT department has already deployed an identity management solution to synchronise our local user directory to Microsoft's cloud platform. Use of this system could be expanded to manage users for other College systems, but we do not have the skills in-house to maintain such a complex system and no service contract is in place with a Microsoft partner.

Hosted applications

The last few years have seen the number of application servers and domains greatly reduced. However, the College does still have a very diverse application estate spread across over 250 virtual machines and hardware devices. Uptime for the vast majority of those systems is acceptable but application support responsibilities are often not clearly defined between IT, MIS, Business Solutions, Learning Technology and third-party support partners.

Resilience

The IT department has had some success in promoting more resilient architectures to application owners. In particular, some collaboration between MIS and IT allowed us to cluster their main database platform. However, in many cases, our high-priority

applications are still fragile and the owner is not always a named individual with clear responsibility. While uptime is generally good, most of our business applications and websites are not architected to use clustering, load balancing, failover or geographic redundancy. This also creates operational and security issues because a standalone system cannot undergo patching or maintenance without application downtime.

Development, test and production
Our application development and test environments are generally not well separated from our live environments or from each other, which creates operational and security issues. The security principle of least-privilege access cannot be followed because development and test users are accessing production systems. Mixing development, test and production also risks instability to live systems when work is carried out on development and test environments.

2.3 Security and continuity

A lot of good work has been done in the last year on our cyber security posture, which has enabled the College to gain Cyber Essentials Plus accreditation. The college is ahead of its peer organisations in some areas but has more to do to increase our overall information security maturity across all digital teams.

2.4 Skills and users

Service desk/user support
The IT service desk and user support in general has held up well following a reduction in the number of helpdesk and infrastructure staff. However, the service desk software is out-of-date and not readily available to any off-campus users or to students.

Service Management
An IT Service Management (ITSM) methodology encompassing service strategy, design, transition, operation and continual service improvement is not embedded in the culture of the IT department, or in other departments providing digital services to the College.

Training
A catalogue of online training has been made available to all IT staff but uptake on the training thus far has been limited by a lack of time dedicated to staff development. Training needs for IT staff must be reviewed and prioritised.

Cross-college collaboration
The College has a slightly unusual structure in that IT, Development, MIS, Library services and Learning Technology are separated among three different lines of management. The Information Management Group will be key to these different departments understanding their shared responsibilities.

Links between IT and other departments are also not as well developed as they should be and this greatly slows the possible rate of technological change. The College's Connect Groups of staff who come together as specialist advisory groups to contribute their expertise will be useful to develop links across teams to address these problems.

2.5 Finance

The IT budget has been managed well to make full use of available capital and also to deliver savings from a reduction in the number of staff and consolidation of systems, applications and licences. Capital funding is received from the SFC on an annual basis which presents a challenge for strategic planning. Use of cloud platforms and leasing of hardware will mean elements of the IT budget need to change from their current capital funding model to operating expenses and this will have to be funded.

2.6 Technology opportunities

Cloud Adoption

Increasing use of cloud platforms presents an opportunity for IT to improve in many areas of service delivery. The IT Infrastructure team has already trialled Infrastructure as a Service (IaaS) on Microsoft Azure's platform and team members are using the online training available to improve their knowledge in this area. Students and IT staff are already using Office 365 for email; other staff have Office 365 Software as a Service (SaaS) but not yet for email. While the capital investment in on-premise storage and compute has already been made, the next two years are a critical time for the College to identify candidate applications which can be migrated to the cloud, whether they be Platform as a Service (PaaS) or Software as a Service (SaaS).

Personal Devices (BYOD)

The use of personal devices by staff and students for work and study could bring substantial benefits to the College, but does also present some risks and challenges. Thousands of staff and students already use their personal devices on the college network but access is often limited and at other times insufficiently managed. Some of the necessary dependencies for BYOD are already in place and the IT team is currently working on the deployment of security tools which will allow us to securely manage personal devices on the college network. No cross-college team has convened yet to consider elements of BYOD beyond the scope of IT.

3. STRATEGIC AIMS AND OBJECTIVES

Where do we want to get to (and how do we get there)?

3.1 User-focused

It is a priority for the IT department to ensure that we deliver systems and services that are in-step with the needs of our staff and students.

To do so, we must:

- Engage regularly with other departments and working groups to understand what they want from us.
- Use a variety of mechanisms to solicit feedback from end-users and from front-line IT staff.
- Listen to new ideas and provide resource to support testing and innovation.
- Provide clear communications to our users and make it easy for them to get help and support.
- Make use of best-practice IT Service Management (ITSM) methodologies to improve IT service delivery.

3.2 Ease of use

Systems which users find difficult to operate cause several challenges. As well as the adverse impact on user satisfaction, these systems require high levels of support and training, and there is a risk of some users duplicating solutions which increases the overall complexity of the IT estate. We must ensure that training is available to increase the knowledge and capability of IT staff and end-users to successfully operate systems at an early stage.

3.3 Resilient

The College has made good progress in the last five years towards increasing the resilience of the core network infrastructure. To ensure that all IT-backed services have an appropriate level of resilience, we must:

- Engage with system and application owners and stakeholders to better understand their requirements and to manage their expectations.
- Work with other support teams to improve the understanding of system dependencies, points of failure, and recovery processes.
- Continue to improve our monitoring capabilities across the different support teams to detect and resolve issues promptly.
- Design new systems with an appropriate level or resilience.
- Use cloud services where appropriate.

3.4 Agile and flexible

We recognise that rapid technological change and changing user requirements will continue for the foreseeable future. As a result, we must continually review our use of available technology to keep pace with new developments. We must use a standards-based approach and limit local customisations which can limit the interoperation of systems and hamper a rapid response to changing requirements.

Poorly-understood or undocumented systems are also a great barrier to the agility of IT systems and we must work with the other support departments to improve our understanding of their systems, and be at the forefront of service model changes.

3.5 Cost-effective

We have a responsibility to ensure that we deliver our services in a cost-effective manner, offering value for money services and where appropriate identify opportunities for service transformation. To ensure we do so, we will:

- Strive to negotiate the best price during contract renewals.
- Maintain an awareness of the different frameworks available to us for procurement.
- Work with the Procurement team to be sure we follow best practices.
- Keep tight control of our budget to identify potential savings.
- Identify opportunities for new IT service delivery models.

3.6 Secure and compliant

As cyber-attacks become more frequent and sophisticated, we need to lead the way in ensuring that the College's systems and information are safe, secure and protected.

We must:

- Maintain a current inventory of hardware and software systems.
- Appropriately secure all systems, devices and information as part of a proportionate risk-based approach.
- Provide appropriate security training to all users.
- Assist the College in maintaining legal compliance.
- Provide digital and cyber-security assurance.

3.7 Control of technical diversity

Where possible, existing applications and systems should be re-used for new projects or requirements. Re-use of existing systems provides value for money by simplifying the IT estate and reducing duplication. The repeated implementation of quick but messy solutions and short-term compromises builds up technical debt and makes it more difficult to develop, test, maintain and secure systems and applications in the future.

4. PERFORMANCE MANAGEMENT?

How do we know we have got there?

4.1 Infrastructure

- Our JISC connection speed at each campus will be increased to prepare for extra demand caused by remote users and internet-based systems.
- Prioritised replacement and upgrade of network equipment will be a core part of Estates and IT redevelopment activities to support increasing network and wireless usage.
- Wireless network health reports will be available to target improvements and the capacity of wireless networks will be increased beyond current levels where required.
- The College's hypervisor estate will be reduced.
- We will be able to reduce the size of our Storage Area Network (SAN) at the next hardware refresh cycle.
- The number of production PBX systems will be reduced and the Skype for Business communications infrastructure will be updated.
- A support or managed service contract will be in place for disaster recovery systems.
- We will have worked with SMT, via the LTT Connect Group, to agree the best funding models in relation to a replacement programme for our classroom equipment.
- The classroom estate (e.g. PCs, Macs, tablets, projectors, interactive panels, etc.) will consist of modern hardware solutions which are fit for a 21st century pedagogy.

4.2 Business applications and systems

- Identity management will be automated between the source Human Resources database and our main authentication directory.
- We will have an inventory of software platforms and applications within the College which includes a named owner and a cloud migration priority score.
- Application owners/teams will own and manage risks to their assets.
- Development and testing environments will be separate from the production environment.
- Configuration change controls will be in place.

4.3 Security and continuity

- The College will retain its Cyber Essentials Plus accreditation annually.
- We will have an inventory of hardware, network and software assets.
- We will be sector-leading in our vulnerability management approach.
- We will centrally collect, analyse and manage system and application logs.
- We will have implemented a College-wide security awareness and training programme.
- There will be awareness throughout the College of our cyber incident response policy and procedures and they will regularly be tested.

- Web application and external network penetration testing will regularly be conducted by a CREST-approved security expert.
- Business applications will each have a criticality rating that fits the application architecture in production.
- IT will be a key member of the College's wider Business Continuity Group.
- Application data in transit across the network will be protected by encryption.

4.4 Skills and users

- The IT service desk will be up-to-date and available from anywhere.
- A training needs analysis that aligns with the IT strategy will have been completed and all IT staff will have a training plan.
- IT will send active representation to the relevant Connect Groups, the Information Management Group, the Business Continuity Group, the HE/FE Shared Technology and Information Services (HEFESTIS) steering committee, and attend sectoral events as a matter of course.
- IT staff will have received training in a suitable ITSM methodology (such as ITIL) and the IT department will have developed a service catalogue.

4.5 Finance

Infrastructure Capital Strategy

Our strategy for the use of capital for infrastructure investment is to take a risk-based approach considering market innovation and newly-available features that might assist the College in reaching its broader goals; vendor support and end-of-life policies; expected operating life; ongoing support and operating costs; the risk and impact of component failure; and the security context in which assets operate. The College's changing requirements (e.g. increased bandwidth requirements) need to be analysed and taken into consideration along with any risks associated with continuing to operate long-lived assets up to the point where they become obsolete.

Useful Life Infrastructure Guidelines

These expected lifetimes of infrastructure asset are a general guide only and no pre-determined upgrade cycles should be followed for upgrades or replacement of the IT infrastructure.

LAN Switching	10 years
Wireless Networks	7 years
Core Networks	8 years
Internet-connected Routers	8 years
Firewalls	7 years
Security Devices	6 years
Servers	7 years
Storage	7 years

4.5.2 Digital devices capital strategy

PC and Mac workstations

Our aim is to maintain a five-year replacement strategy in respect of PC and Mac workstations, laptops and tablets based on capital expenditure. Due to shortfalls in capital funding over the past few years this has not been possible. To provide the best student experience we can afford, our workstation replacement strategy is to use available capital funds to target areas most in need of investment and redistribute the best of the older equipment to areas where the computing requirements are less intensive.

Audio Visual classroom systems

Audio Visual equipment used within classrooms, if appropriately purchased, will physically last anywhere between five and 10 years. Our approach is to replace equipment on the basis of failed devices and changes to classroom use following consultation with faculties on their delivery requirements. Newly-created rooms are always completed in consultation with faculties/departments.

4.6 Technology opportunities

Cloud Adoption

- A cloud Infrastructure as a Service (IaaS) pilot project will be run and the results made available to senior management.
- The College's IT infrastructure will be delivered from a hybrid cloud model using internet-based services where it is cost-effective.
- The College will be making extensive use of Software as a Service (SaaS) offerings available under our Microsoft Campus Agreement.
- Development,test systems and applications will be placed in the cloud.
- IT, MIS, Learning Technology and Development staff will be appropriately trained to make best use of available cloud systems.
- Selected internal applications will be redesigned by MIS and Development to use the PaaS model.
- The College will have a Cloud Strategy Connect Group with representation from IT, information security, data classification, risk management, finance, HR, application teams and business units.
- Each campus will have a Virtual Private Network (VPN) or ExpressRoute connection to the Microsoft cloud.

Personal Devices (BYOD)

- We will have in place the necessary solutions to permit eligible users to use their personal devices on the College network without unduly compromising the security of the College networks and systems.
- Our policies will be updated to provide guidance for acceptable use of personal devices and to limit the College's liability for those devices.
- We will have dedicated spaces in shared areas with network and charging points for staff and students using their own devices.
- We will have a device purchase scheme to enable students to buy a device at a discounted rate.
- We will have worked with the Learning, Teaching and Technology (LTT) connect group to identify suitable candidate classes to trial further adoption of personal devices in the classroom.

5. GOVERNANCE
Who is responsible?

5.1 IT management

The IT management team is responsible for instilling the IT staff the values and beliefs set out in this strategy and for interpreting it at an operational level; for creating an appropriate departmental culture; for effectively using the skills and competencies of our staff; and for taking an executive role in the strategy implementation.

5.2 Senior management

Executive support and management buy-in are critical to achieving the IT strategy, particularly within the areas of cross-college collaboration, funding, control of technical diversity, security, and compliance.

6. PERFORMANCE REPORTING
When will we review and report progress?

6.1 Strategy review timescales

The operational IT management team meet on a monthly basis. Every three months, a strategic review and progress update will be included at these meetings.

7. CONTACT DETAILS

Who do I contact to get more information or other copies?

Head of Estates & IT

Edinburgh College

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